

# **Mancos Source Water Protection Plan**



**Montezuma County, Colorado**

**March 2009**

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For the community water providers:  
Town of Mancos: ID # CO0142700  
Mancos Rural Water Company: ID # CO0142600  
Mesa Verde National Park: ID # CO 0142750

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## EXECUTIVE SUMMARY

The Mancos Valley is served by three community water systems: Town of Mancos, Mancos Rural Water Company, and Mesa Verde National Park. They value a clean, high quality drinking water supply and decided to work collaboratively with area stakeholders to develop a Source Water Protection Plan to protect their water source, the upper West and Middle Mancos River watershed. During the months of September 2008 to February 2009, four stakeholder meetings were held in Mancos, Colorado to encourage local public participation. The planning process attracted interest and participation from 22 people including local citizens, water operators, government, industry, and agency representatives. This group comprised the Mancos Planning Team (the Planning Team or Team).

The Team initially reviewed the Source Water Assessment completed by the Colorado Department of Public Health and Environment. The Assessment included the delineation of the source water protection area, potential sources of contaminants, and the susceptibility of these contaminants to degrade the water source. Using this information as a starting point, the Team requested a re-delineation of the protection area to include areas not included in the State's Assessment. The delineated source water protection area defines the region where the Team has chosen to implement its source water protection measures to reduce source water susceptibility to contamination.

To develop their management approach, the Planning Team focused on the following issues of concern within the Source Water Protection Area: agricultural practices, oil and gas development, septic systems, transportation on roads, land uses, private water wells, residential practices, mining, regional air pollution, zebra and quagga mussels, and forest lands.

The Planning Team reviewed and discussed several possible management approaches that could be implemented within the protection area to help reduce the risks of potential contamination to the community's source water. Voluntary implementation of source water management approaches at the local level (i.e. county and municipal) applies an additional level of protection to the drinking water supply by taking preventive measures to protect the source water. The Planning Team established a "common sense" approach in identifying and selecting the most feasible source water management activities to implement locally. These management practices included in this Plan are recommended by the Team to reduce the risks of potential contaminants to the Source Water Protection Area and protect the drinking water source for the Mancos Valley community.

At the completion of this plan, a Steering Committee was formed to oversee its implementation. Representatives from the Town, water providers, community, and government agencies who participated on the Planning Team volunteered to serve on the Steering Committee and meet quarterly throughout the year. The first meeting of the Steering Committee is scheduled for March 20, 2009. At this first meeting the Committee will decide which management approaches to implement during 2009.

The Colorado Rural Water Association's Source Water Protection Specialist, Colleen Williams, helped facilitate the source water protection planning process. The goal of the Association's Source Water Protection Program is to assist rural and small communities served by public water systems to reduce or eliminate the potential risks to drinking water supplies through the development of Source Water Protection Plans, and provide assistance for the implementation of prevention measures.

## INTRODUCTION

The Mancos Valley is served by three community water systems: Town of Mancos, Mancos Rural Water Company, and Mesa Verde National Park. All three water providers share the same water supply, the Upper West and Middle Mancos River watershed. They realized that in order to protect the source of their drinking water, they needed to work together to develop a protection plan to prevent possible contamination of this valuable resource. Proactive planning and prevention are essential to both the long-term integrity of their water system and limiting their costs and liabilities.

Table 1. Contact Information

PWSID	PWS Name	Name	Address	City	ST	Zip	Phone
CO0142700	Town of Mancos	Robin Schmittel	Box 487	Mancos	CO	81328	970-533-7725
CO0142750	Mancos Rural Water Company	Eldon Simmons	604 Bauer Street	Mancos	CO	81328	970-533-7435
CO0142600	Mesa Verde National Park	Allan Loy	Box 8	Mesa Verde	CO	81330	970-529-5067

### Purpose of the Source Water Protection Plan

The Source Water Protection Plan (SWPP) is a tool for the Mancos Valley community to ensure clean and of high quality drinking water sources for current and future generations. This Source Water Protection Plan is designed to:

- Create an awareness of the community's drinking water sources and the potential risks to water quality within the watershed;
- Encourage education and voluntary solutions to alleviate pollution risks;
- Promote management practices to protect and enhance their drinking water supply;
- Provide for a comprehensive action plan in case of an emergency that threatens or disrupts the community water supply.

Developing and implementing source water protection measures at the local level (i.e. county and municipal) will complement existing regulatory protection measures implemented at the state and federal governmental levels by filling protection gaps that can only be addressed at the local level.

## Public Participation in the Planning Process

Public participation is vitally important to the overall success of Colorado’s Source Water Assessment and Protection (SWAP) program. Source water protection was founded on the concept that informed citizens, equipped with fundamental knowledge about their drinking water source and the threats to it, will be the most effective advocates for protecting this valuable resource. Local support and acceptance of the plan is more likely where local stakeholders have actively participated in the development of their protection plan.

During the months of September 2008 to February 2009, four stakeholder meetings were held at the Mancos Town Hall in Mancos, Colorado to encourage local public participation in the planning process. Local stakeholders were sent letters of invitation to participate with follow-up by postcards and email reminders of meeting dates. The source water protection planning process attracted interest and participation from 22 people including local citizens, water operators, government, industry, and agency representatives. Input from the following list of Planning Team participants was greatly appreciated.

Table 2. Mancos Source Water Protection Plan Participants

<b>Participant</b>	<b>Affiliation</b>
Tom Yennerell	Town of Mancos Administrator
Robin Schmittel	Town of Mancos Director of Public Works
Chris Kramer	Town of Mancos Water Plant Operator
James Dietrich	Montezuma County
Melissa Wilson	Montezuma County Health Department
Felicity Broennan	Mancos Valley Watershed Project
Gary Kennedy	Mancos Water Conservancy District Superintendent
Eldon Simmons	Mancos Rural Water Company
Jack Burk	Mancos Conservation District President
Tom Wolf	Mancos Conservation District and Mancos Valley Watershed Project
Russell Klatt	Mancos Conservation District
Tom Rice	Bureau of Land Management and U.S. Forest Service
Shauna Jensen	U.S. Forest Service and Bureau of Land Management
Allan Loy	Mesa Verde National Park
George San Miguel	Mesa Verde National Park
Nadia Hebard	Mancos Valley Watershed Project
Colin Larrick	Ute Mountain Ute Tribe
Jeremiah Cuthair	Ute Mountain Ute Tribe
Eddie Balch	Colorado Rural Water Association
Colleen Williams	Colorado Rural Water Association
Scott Clow	Ute Mountain Ute Tribe
Raymond Keith	Mancos Rural Water Company

## Protection Plan Development

The source water protection planning effort consisted of public Planning Team meetings and individual meetings with water operators, government, and agency representatives. Information discussed at the meetings helped the Team develop an understanding of the issues affecting source water protection for the Mancos Valley community. The Team then made recommendations for management approaches to be incorporated into a protection plan. In addition to the Planning Team meetings, data and other information pertaining to source water protection areas was gathered via public documents, internet research, phone calls, emails, and field trips to the protection area. A summary of the meetings is presented below.



PHOTO: COLLEEN WILLIAMS

Figure 1. The Planning Team meetings attracted interest and participation from 20 people.

Table 3. Presentations, Tours, and Planning Team Meetings

Date	Purpose of Meeting
2/13/08	Presentation of the Source Water Protection Planning process to the Town Council of Mancos, Colorado at its regular monthly meeting.
9/10/08	First Planning Team meeting with presentation on the process of developing a Source Water Protection Plan for the Mancos Valley community. Review of the State's Source Water Assessment and discussion of the delineation of the source water protection area.
10/29/08	Second Planning Team meeting with discussion on the State's inventory of potential sources of contamination and identification of issues of concern. Information sharing on mining activity in the area, oil and gas operations, forest issues, roads, septic systems, agriculture, Box Canyon tributary, zebra and quagga mussels, regional air pollution, and land use/growth issues.
10/30/08	Tour of the water sources and treatment plant for the Town of Mancos with Chris Kramer, Town of Mancos Water Operator and Robin Schmittl, Mancos Director of Public Works.
12/10/08	Third Planning Team meeting with discussion of issues of concern and management approaches to include in the Protection Plan. Discussion on source water areas that were not included in the delineation and decision to request a re-delineation of the protection area.
2/11/09	Fourth Planning Team meeting to review and edit the Draft Plan; appoint a Steering Committee; set the date for the first Steering Committee meeting; and implement one of the action items on the Plan.

## Steering Committee Members

At the completion of this plan, a Steering Committee was formed to implement the management approaches of this Source Water Protection Plan. Members of the Planning Team volunteered to serve on the Steering Committee and meet quarterly throughout the year. The first meeting of the Steering Committee is scheduled for March 20, 2009. At this first meeting the Committee will develop an Action Plan for management approaches to implement during 2009.

Table 4. Steering Committee Members

<b>Name</b>	<b>Affiliation</b>
Tom Yennerrel	Town of Mancos Administrator
Robin Schmittel	Town of Mancos Public Works Director
Melissa Wilson	Montezuma County Health Department
Felicity Broennan	Mancos Valley Watershed Project
Gary Kennedy	Mancos Water Conservancy District
Eldon Simmons	Mancos Rural Water Company
Tom Wolf	Mancos Conservation District and Mancos Valley Watershed Project
Shauna Jensen	U.S. Forest Service and Bureau of Land Management
Allan Loy	Mesa Verde National Park
George San Miguel	Mesa Verde National Park
Colleen Williams	Colorado Rural Water Association

# WATER SUPPLY SETTING

## Location

The Mancos Valley is located in Montezuma County in the southwest corner of Colorado. Montezuma County covers approximately 2,084 square miles and has a population of 24,926 (MCCWPP, 2006). The County seat is located in the City of Cortez, the largest city in the county. The Mancos Valley is accessed via Highway 160, Colorado's principal east-west connection between Durango and Cortez. Thirty-six percent of Montezuma County is federal land, thirty-three percent tribal lands, and thirty percent private land.

Location of Montezuma County, Colorado

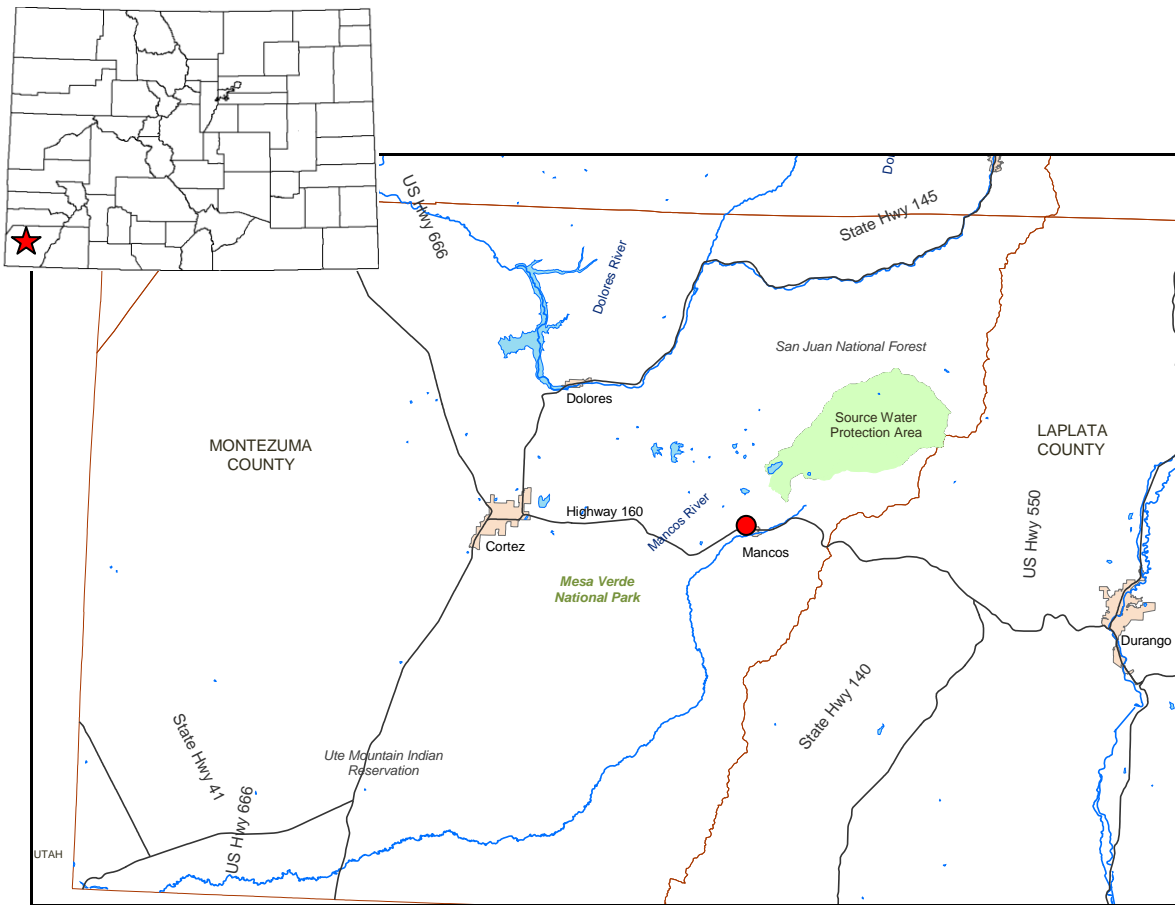
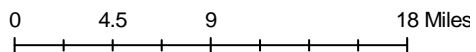


Figure 2. Regional Setting Map

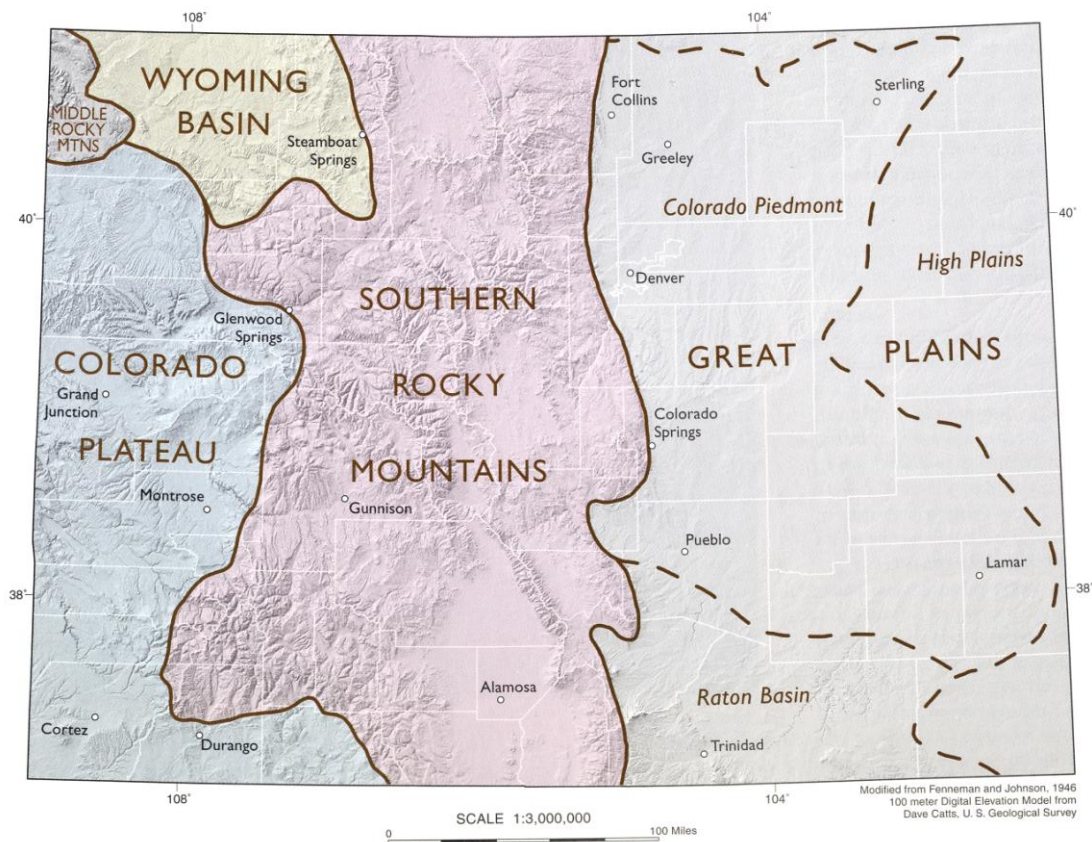




## Physiography

The source water protection area lies within two distinct geological units. The headwaters of the Upper West and Middle Mancos River watershed lie within the La Plata Mountains, a small sub-range of the San Juan Mountains, which are part of the southern Rocky Mountains physiographic area. The San Juan Mountains are unusual within the north-south orientation of the Rocky Mountains, in that they are a large mountain range with an east-west orientation (DLMP, 2007). The lower portion of the protection area is located within the physiographic area called the Colorado Plateau. This high-desert terrain of the Colorado Plateau consists of a succession of plateaus and mesas that gradually cascade away from the mountains and broad structural valleys and basins. The area is semiarid, sparsely vegetated, and sculpted by the tributaries of the San Juan River. The Colorado Plateau is characterized predominantly by sedimentary rocks.

Figure 3. Physiographic Provinces of Colorado

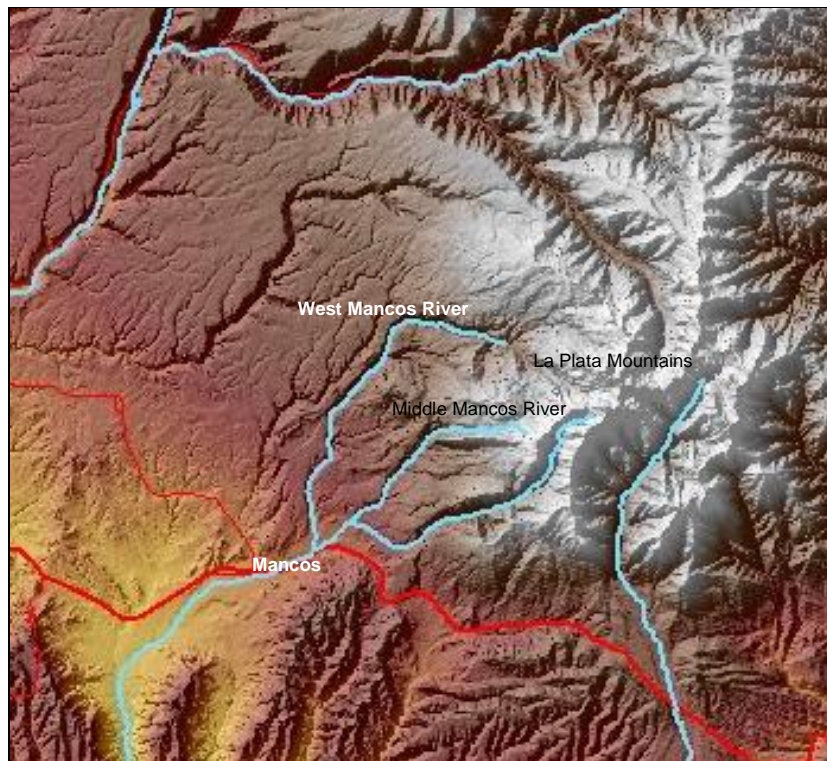


SOURCE: GROUND WATER ATLAS OF COLORADO

## Topography

The source water protection area lies within the Upper West and Middle Mancos River watershed, a portion of the 800 square mile watershed of the Mancos River. The upper watershed is bound by the La Plata Mountains in the north east and a low ridge line to the northwest. The highest peaks in the watershed are Burro Mountain 11,552 feet, Sharkstooth Peak 11,686 feet, Centennial Peak 13,062 feet, Hesperus Mountain 13,234 feet, Lavendar Peak 13,240 feet, Mount Moss 13,192 feet, Spiller Peak 13,123 feet, and Helmet Peak 11,969 feet. The higher elevations of the watershed are dominated by Ponderosa Pine, Spruce, fir and aspen. The Upper West and Middle Mancos River originates in the alpine tundra and flows downstream through forested mountains and canyons. The lower south eastern boundary of the watershed is at elevations of 7,400 feet. The Town of Mancos is located southwest of the source water protection area at an elevation about 7,000 feet.

Figure 4. Topography of the Source Water Protection Area



SOURCE: COLORADO DIVISION OF WATER RESOURCE

## Geology

Shale of the Mancos Formation underlies much of the Mancos River area. To the north, it is bordered by outcrop areas of sandstone from the Dakota Formation or covered by alluvial and colluvial deposits. The Mancos Formation, consisting mainly of gray silty clay shale of marine origin, is the principal source of salt-loading in the Mancos Valley. The salts consist mainly of various sulfate minerals, which are concentrated in certain zones within the shale and younger shale-derived alluvial deposits. These shale-derived alluvial deposits are usually a few feet below the ground surface in the more arid lower portions of the valley. The upper portion of the watershed contain moderate to low levels of salt.

Another minor source of salt-loading in the valley is a zone of salt associated with the coal bed lying in the upper part of the Dakota Formation. This coal bed is overlain by several feet of resistant sandstone and is only infrequently exposed. Where this sequence of coal and sandstone lies near the surface in irrigated areas, the slow infiltration of irrigation water through fractures in the sandstone and the coal bed results in the gradual leaching and delivery of salts to the stream system (MVSCP, 2004)

Figure 5. Geology in the vicinity of the upper Mancos River watershed.

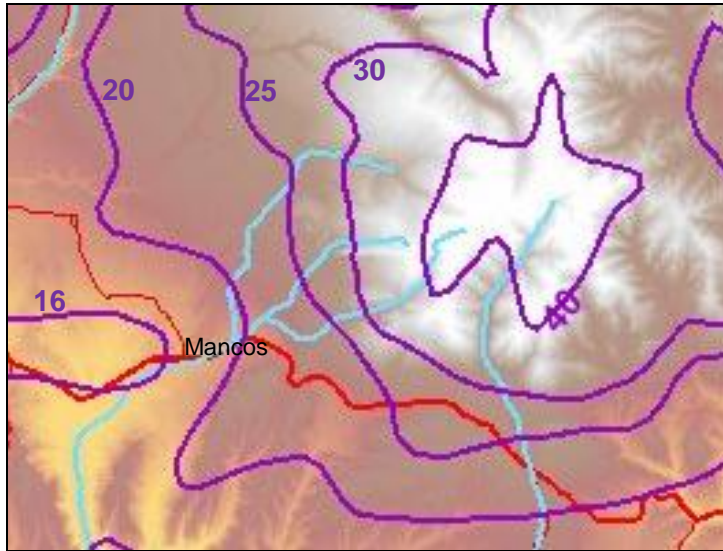


Legend
Qe – gravels and alluviums
TKi – Laramide Intrusive Rocks
Km – Mancos Shale
Kdb – Dakota Sandstone and Burro Canyon Formation
Jmwe – Morrison, Wanakah, and Entrada formations
Jm - Morrison

SOURCE: U.S. GEOLOGICAL SURVEY

## Climate

Figure 6. Average Annual Precipitation



SOURCE: COLORADO DIVISION OF WATER RESOURCE

The climate of the Colorado Plateau physiographic provinces is semi-arid and generally has abundant sunshine, low relative humidity, large daily temperature variations, high to moderate winds, and little precipitation. The dissected and varied topography produces varied micro-climatic conditions. Valleys and basins between mesas may exhibit semi-arid, desert-like conditions, while alpine conditions can exist at the higher altitudes. At elevations below 9,000 feet, average annual precipitation ranges from about 8 to 18 inches, while mountain ranges receive in excess of 32 inches.

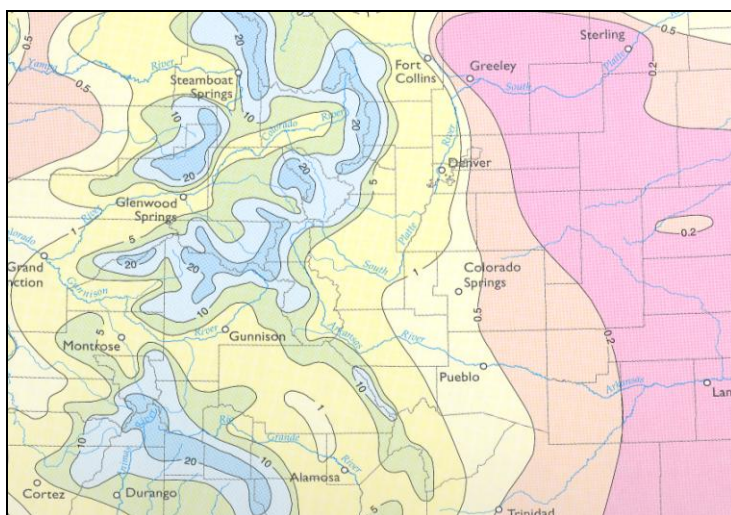
The Town of Mancos is located at an elevation of 6,980 feet and has a mean annual precipitation of 16 inches per year. The annual mean air temperature is 46 degrees F, with an average growing season of 110 days.

Winter and spring storms represent the majority of the precipitation in this region. Summer thunderstorms, although brief, can often be very intense, producing 20 to 40 percent of the annual precipitation (Robson and Banta, 1995).

Most of the precipitation that falls on the land surface during storm events flows directly into drainages, streams, and rivers as runoff. Some of the water will infiltrate the soil and recharge the underlying aquifers.

The average annual runoff for the West Mancos River watershed is 20 inches at the top of the ridges and between 10- to 20 inches near Jackson Reservoir.

Figure 7. Average Annual Water Runoff in Colorado



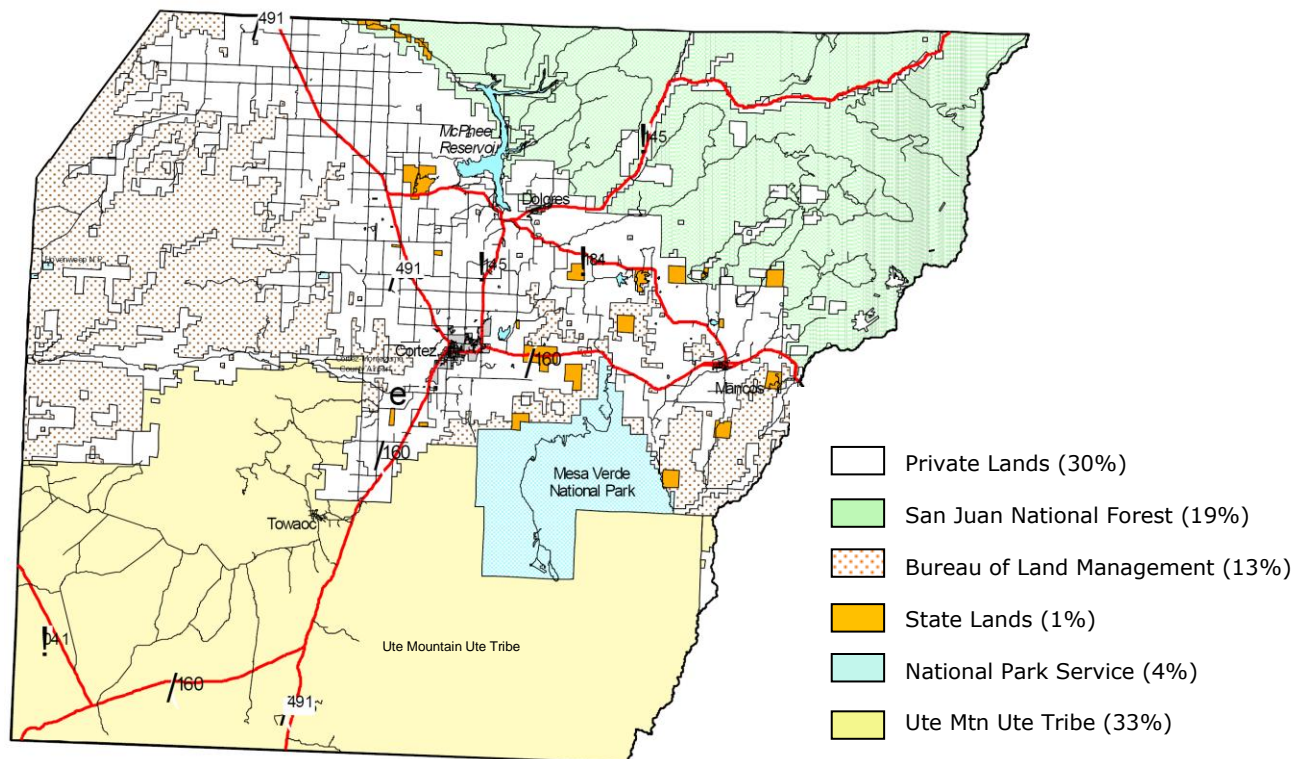
SOURCE: GROUND WATER ATLAS OF COLORADO

## Land Ownership

Montezuma County encompasses 1,333,888 acres or 2,084 square miles, consisting of private land (30%), federal lands (36%), state lands (1%), and lands of the Ute Mountain Ute Tribe (33%). Of the federal lands, 53% are part of the San Juan National Forest, 11% are managed by the National Parks Service (mostly Mesa Verde National Park) and the remaining 36% are managed by the Bureau of Land Management (Figure 8) (Magna et al, 2004).

The Mancos Source Water Protection area lies within the unincorporated land of Montezuma County. Most of the land in the protection area is owned by the federal government with lands managed by the U.S. Department of Agriculture's Forest Service and Department of the Interior's Bureau of Land Management. The other land is privately owned land managed by Montezuma County.

Figure 8. Land Ownership in Montezuma County



SOURCE: MONTEZUMA COUNTY PLANNING DEPARTMENT

## Land Use

Land use within Montezuma County primarily consists of agriculture, urban and rural development, tourism, recreation, and industry. Agriculture is the economic and social foundation upon which Montezuma County has been built. It is a source of livelihood as well as holds aesthetics and cultural values within the valley. The importance of protecting the agricultural base in the valley is a goal identified by local and county government.



Figure 9. The Mancos Valley residents value their agricultural way of life.

## Land Administration

Most of the land use decisions for the unincorporated areas of Montezuma County are made by the Montezuma County Board of Commissioners with recommendation from the Montezuma County Planning Commission and department staff. The Department of Planning and Zoning administers, on behalf of the Board of County Commissioners, Montezuma County's land use regulatory system. The Department coordinates issues relating to physical land use and development activities in Montezuma County as well as long range planning.

The Montezuma County Comprehensive Land Use Plan, adopted in 1997, provides a framework for decision making and serves as a guide to development within the unincorporated Montezuma County. The Plan is advisory only and has no regulatory effect. The Plan asserts that the most effective way to meet environmental protection and improvement goals is for local communities and regulatory agencies to work as partners. This will allow for effective resource stewardship while protecting the stability and health of local economics and local communities (MCCLUP, 1997).

## Zoning Regulations

A "Comprehensive Land Use Plan for the unincorporated areas of Montezuma County" was adopted on January 6, 1997 and is called "LIZ" or Landowner Initiated Zoning. LIZ initially included a sign up period that allowed landowners to choose their own zoning, under conditions and some restrictions. After this period, which ended in 2000, the landowner-selected categories were amended into the code on November 6, 2000. Zoning is now required in order to subdivide land and must be approved at the appropriate density, including Agriculture/Residential 3-9 Acres, through a public hearing process (CEDS, 2006).

## Population and Growth

Montezuma County is one of the least populated counties in the State of Colorado with approximately 24,926 residents, of which 14,222 live in unincorporated area outside of the County's three towns (MCCWPP, 2006). The average of 11.3 people per square mile is low compared to the State average of 41.4. Population concentrations include Cortez, Dolores, Mancos, and the Ute Mountain Ute Tribe at Towaoc.

From 1990 to 2000, Montezuma County saw a 2.7% annual average growth rate. From 2000 to 2005, Montezuma County as a whole has seen slow but steady population growth, with 0.9% average annual change. Over this 5 year period, the population grew by 5.82%. The Town of Mancos has seen the most growth (1.8%) during this time period. The rate of growth is projected to rise and then decrease over the next 20 year, following statewide trends (Table 5).

Table 5. Projected Growth Rate

Montezuma County	2005	2010	2015	2020	2025	2030	2035
Population	24,862	27,576	30,636	33,752	36,816	39,653	42,061
Avg. Annual % Change		2.1%	2.1%	2.0%	1.8%	1.5%	1.2%

These population figures do not reflect the number of seasonal residents in the area. A local study on 2<sup>nd</sup> homes indicates that 13% of residential properties are owned by people that live outside of the county (Montezuma County, 2006).

Major growth impacts will be from the Dolores Project development, expansion of the agriculture and tourist industries, the desirability of the area for retirement, and the continued development of nearby energy resources. The Dolores Project was designed to divert and store water from the Dolores River for irrigation on arable dry lands and supplemental irrigation water to other areas in Montezuma and Dolores Counties (MVSCPP, 2004).

## Economic Development

Employment has grown at a slightly slower rate than the population, but has kept up with the growth of the labor force. Unemployment was high in the early 1990s but has been in the decline and converging with the unemployment rate of the state. Montezuma County does have the concern of cyclical unemployment throughout the year. Much of this is because of the county's dependence on the tourism industry, which is essentially outdoor recreation and park based summer tourism.

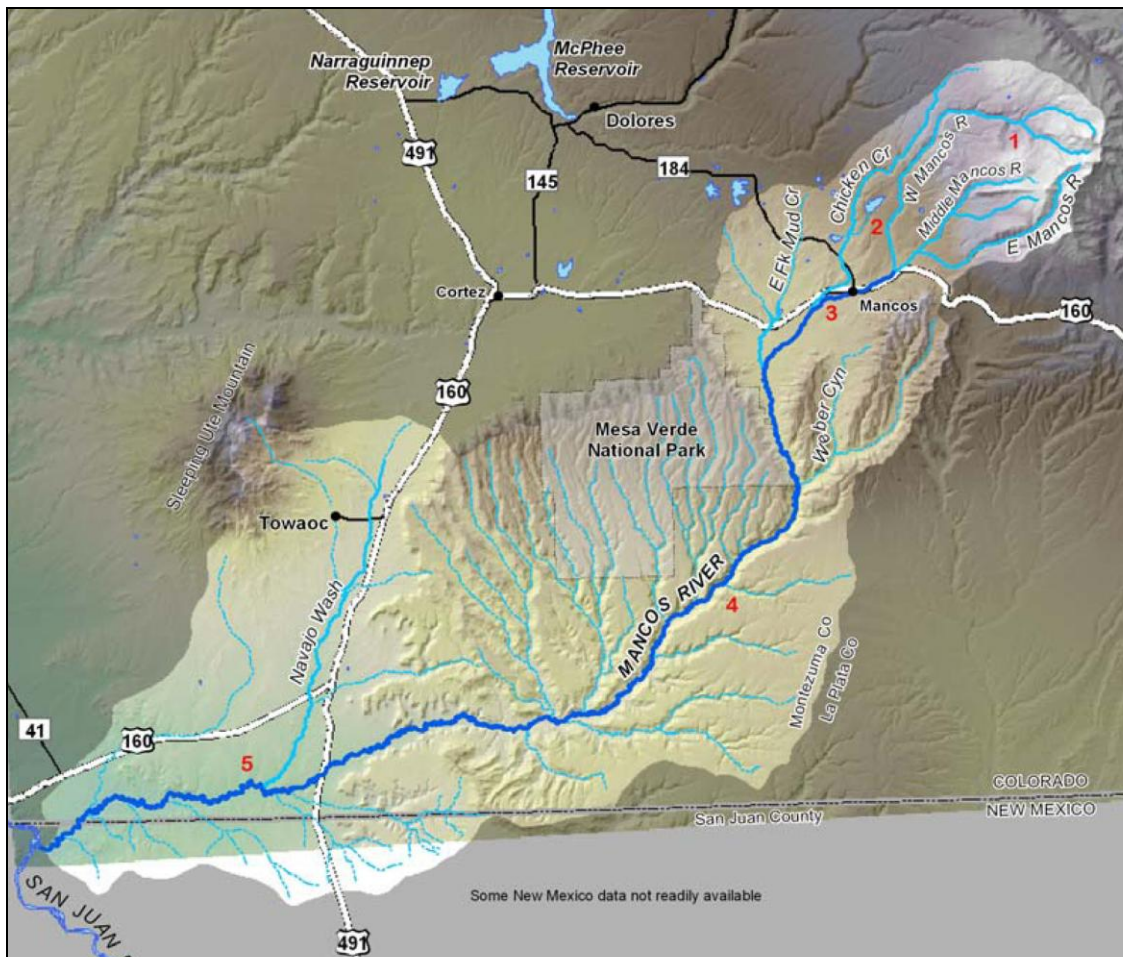
Tourism is the source of more than one-quarter of direct base employment in Montezuma County. The service and trade sectors are bolstered by the tourism appeal of the county, and are the leading sources of employment. Agriculture continues to be an important sector in the Montezuma County economy. Production is the highest in the region, and 70% of the private land in the county is in agriculture. Against regional trends, farmland is increasing in Montezuma County, as are the number of farms (Magna et al, 2004).

# WATER QUALITY SETTING

## Hydrology

The Mancos River originates in the western flanks of the La Plata Mountains, a western subrange of the San Juan Mountains in southwestern Colorado. It then flows southwest through the Mancos Valley and Mancos Canyon, until it joins the San Juan River in northwestern New Mexico (Figure 10). The river is 185 km or 116 miles in length, including the major upstream tributaries, and drains an area of approximately 2075 km<sup>2</sup> (800 miles<sup>2</sup>). The Mancos River watershed (Hydrologic Unit Code 14080107) is often divided into two main parts: an upper watershed of approximately 527 km<sup>2</sup> (203 miles<sup>2</sup>) that includes Mancos Valley and the surrounding mountains, and a lower area that begins in Mancos Canyon at the confluence with Weber Creek, and drains the mesa and desert lowland country of Mesa Verde National Park, the Ute Mountain Ute Indian Reservation, and the surrounding regions. Four main tributaries begin among the ridges and peaks of the upper watershed. They are the East, Middle and West Mancos Rivers, and Chicken Creek (Stacey, 2007).

Figure 10. Map of the Mancos River watershed and hydrogeomorphic sections



SOURCE: FUNCTIONAL ASSESSMENT OF THE MANCOS RIVER WATERSHED (STACEY, 2007)



### Functional Assessment

In 2007, the Mancos Conservation District contracted with the University of New Mexico to complete a Functional Assessment of the Mancos River watershed to examine the condition and ecological health of the watershed. The river was divided into 5 general sections based on hydrogeomorphology and ecology as identified in Figure 10. Sections 1 and 2 are located within the source water protection area of the upper West Mancos River watershed, (HUC 1408010701), a subwatershed of the Mancos River Watershed.

Section 1 includes the high elevation reaches in the mountains, generally above 2900 meters (9500 feet). The streams here are small, straight, narrow and high gradient. Various tributaries eventually combine to form the main Mancos River, including the East, Middle and West Mancos Rivers, and Chicken Creek. The banks and channel bottom are typically either bedrock or comprised of boulders and other material from nearby rock formations. The surrounding vegetation is characteristic of southern Rocky Mountain alpine tundra, sub-alpine, and spruce-fir forests. Common riparian trees and shrubs in this section include various willows (*Salix spp.*) and aspen (*Populus tremuloides*).

Section 2 includes the upper plateau and canyon reaches, generally between 2300-2900 meters (7500-9500 feet). The major tributaries of the Mancos in this section are lower gradient and form deep canyons that cut through relatively flat plateaus. The canyon walls are steep, often forming cliffs, and the bottoms are relatively flat. The canyons progressively widen as one moves farther downstream. The stream channel tends to be deeper than in reaches farther upstream, and the bottom and banks are comprised primarily of cobble and larger material that has been washed downstream from the mountains. In some cases, the channel also exhibits limited meanders. The surrounding vegetation is primarily southern Rocky Mountain mixed conifer and Douglas-fir (*Pseudotsuga menziesii*) forests at the higher elevations, and ponderosa pine (*Pinus ponderosa*) at the lower elevations, although many different species of conifer occur together within the canyons themselves. Riparian species include willows, aspen, and narrow-leaf cottonwood (*Populus angustifolia*). There are also large aspen stands on the plateaus above the canyons in this section.

Despite the long history of intensive human use of the watershed, many aspects of the stream-riparian ecosystem are currently in good or very good functional condition, especially when compared to similar sized river systems elsewhere in the American Southwest. The results of the functional assessment of the two upper sections of the watershed showed that the water quality was generally good, there was little active bank erosion or channel downcutting in the main river or the major tributaries, fine sediment deposition on the channel bottom was limited, the diversity of aquatic macroinvertebrates within the river was mostly excellent, and there were few non-native or exotic shrubs and trees, such as salt cedar (*Tamarix ramosissima*) and Russian olive (*Elaeagnus angustifolia*). The lack of invasion of the riparian zone by exotic woody plants is exceptional for river systems like the Mancos in the southwest.

The assessment indicated that these two high altitude sections of the source water protection area only showed minor direct impacts from past or current human activities. These consisted primarily of historic hard-rock mining activity, several small dirt roads along limited sections of the streams, limited aspen harvests on the top of the plateaus, livestock grazing, and channel and floodplain modifications resulting from construction of numerous water diversion structures (Stacey, 2007).

## Water Quality Standards

Under the Clean Water Act, every state must adopt water quality standards to protect, maintain and improve the quality of the nation’s surface waters. The State of Colorado’s Water Quality Control Commission has established water quality standards that define the goals and limits for all waters within their jurisdictions. Colorado streams are divided into individual stream segments for classification and standards identification purposes (Table 6). Standards are designed to protect the associated classified uses of the streams (Designated Use). Stream classifications can only be downgraded if it can be demonstrated that the existing use classification is not presently being attained and cannot be attained within a twenty year time period (Section 31.6(2)(b)). A Use Attainability Analysis must be performed to justify the downgrade.

Table 6. Stream segments within the Mancos River Watershed and their Designated Uses

Segment	Portion of Segment	Designated Use
COSJLP04a	Mainstem of the Mancos River, including all wetlands, tributaries, lakes, and reservoirs, from the source of the East, West and Middle Forks to Hwy 160, except for the specific listing in segment 4b.	Aquatic Life Cold 1 Water Supply Agriculture Recreation N (Nov. 1 – April 30) Recreation E (May 1 – Oct. 31)
COSJLP04b	Mancos Reservoir (Jackson Gulch Reservoir)	Aquatic Life Cold 1 Water Supply Agriculture Recreation E

SOURCE: COLORADO WATER QUALITY CONTROL COMMISSION (CDPHE, 2007)

- Aquatic Life Cold 1: Refers to waters that are capable of sustaining a wide variety of cold water biota, including sensitive species.
- Agriculture: Refers to waters that are suitable for irrigation or livestock use.
- Water Supply: These surface waters are suitable (or through standard water treatment would become suitable) for potable water supplies.
- Recreation E - Existing Primary Contact Use: These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975.
- Recreation N - Not Primary Contact Use: These surface waters are not suitable or intended to become suitable for primary contact recreation uses. This classification shall be applied only where a use attainability analysis demonstrates that there is not a reasonable likelihood that primary contact uses will occur in the water segment(s) in question within the next 20-year period.

## Impaired Waters

Stream segments within the Mancos River watershed are listed on the 2008 State’s 303(d) list of impaired waters (Table 7). States are required under the Clean Water Act to submit to Congress their list of impaired waters that do not meet the state’s water quality standards for their designated and existing uses. States are also required to develop a watershed restoration action plan called a “Total Maximum Daily Load” for each impaired water body.

Table 7. Stream segments within the Mancos River Watershed on the 2008 State’s 303(d) list

WBID	Segment Description	Portion	Impairment	Priority
COSJLP04a	Mancos River and tributaries above HWY 160	E. Mancos River	Cu	High
COSJLP04a	Mancos River and tributaries above HWY 160	all	Zn	Low

SOURCE: COLORADO WATER QUALITY CONTROL COMMISSION (CDPHE, 2008)

### Box Canyon Creek

Box Canyon Creek, a tributary to the West Mancos River was included on the 1998 Colorado 303(d) list of impaired waters because excessive sediment deposition had resulted in the stream not supporting its cold water class 1 aquatic life use designation. A Total Maximum Daily Load (TMDL) for sediment was approved for Box Canyon in June, 2000.

Since 2000, when the TMDL was approved, the San Juan National Forest has completed a number of watershed restoration projects and changed land management practices to address sediment sources in the watershed. These activities included closure and restoration of roads, change in travel management designation to restrict off-road travel, construction of drift fences to better manage livestock distribution and reduction in livestock stocking and forage utilization. The result of these mitigation activities resulted in water quality and habitat improvements since 1996. While the TMDL target for fine sediment has not been reached in all stream reaches in Box Canyon, the target for road density and the TMDL goal for macroinvertebrate diversity have been achieved as measured in 2006. Therefore, the aquatic life use was determined to be attained and Box Canyon Creek was removed from the Colorado 303(d) listing (Carlson, 2007).

Preventing degradation of the surface and in the watershed is important to the Mancos Valley community in order for them to provide a safe, high quality drinking water supply to their customers. A copy of the "Status of Water Quality in Colorado - 2006" and the "Box Canyon TMDL Evaluation" is included in the Appendices of this report.

### **Mancos Conservation District**

The Mancos Conservation District (MCD) was established in 1948 to represent private and public landowners of the Mancos Valley in the conservation of natural resources. Their mission is to ensure health, safety, and general welfare of the citizens through a responsible conservation ethic. MCD has been involved in watershed protection and restoration activities in the Mancos Valley including: a rapid watershed assessment funded by NRCS; ongoing water quality monitoring of five stations with the River Watch program; eradication of 60 acres of Russian olive and tamarisk along the Mancos River; an aquatic habitat river restoration project; working with ranchers to fence cows out of riparian habitat; a riparian corridor assessment; training 15 volunteers to use the riparian assessment protocol; and initiating and participating in the development of a Source Water Protection Plan for the Mancos Valley.

Recently, MCD applied for a Section 319 grant from the Colorado Department of Public Health and Environment to develop a long-term watershed management plan for the Mancos River. The project is called the Mancos Valley Watershed Project. The MCD's vision of creating a watershed restoration and protection plan is a landmark effort to address the water quality and quantity issues from a holistic approach using "Colorado's Watershed Cookbook: Recipe for a Watershed Plan" as a guide. The overall program goal of the watershed plan is to create a working document that guides the stakeholders in prioritizing and implementing projects that result in the improvement of water quality in the watershed.

The watershed planning effort is a collaborative process involving a dedicated group of stakeholders representing the Dolores Public Lands Office (includes the San Juan National Forest and the San Juan Resource Area, Bureau of Land Management), Montezuma County, Town of Mancos, MCD, local landowner and ranchers, ditch companies, Mesa Verde National Park, Colorado Division of Wildlife, NRCS, Mancos Rural Water Company, Ute Mountain Ute Tribe, Navajo Nation, and the local land conservancy.

## Drinking Water Supply Operation

### Town of Mancos

The Town of Mancos is a small rural community located in Montezuma County, between Durango and Cortez on US 160. It is 30 miles west of the city of Durango and five miles east of the entrance to Mesa Verde National Park at Longitude 37°20'44"N, Latitude - 108°17'33"W.

The Town of Mancos covers an area of one-half square miles and is situated in the agriculturally-rich Mancos River valley at an elevation of 7,000 feet. The Town has 494 residential dwellings, a population of 1,119 residents, and an old western town charm. As an incorporated town, its municipal affairs are governed by the Mancos Town Council.



PHOTO: COLLEEN WILLIAMS

Figure 11. The Town of Mancos retains a heritage based on ranching and the manufacture of timber products

The source waters for the Town of Mancos include the water diverted directly from the West Mancos River and the water that is stored in the Jackson Gulch Reservoir. Upstream from the Town's intake, the West Mancos River also receives water stored in Weber Reservoir that originates from the Middle Mancos River. Raw water from the West Mancos River intake is diverted into a settling pond and piped for approximately 4 miles to the Town's water treatment plant. Raw water at the treatment plant is again diverted into another settling pond prior to being treated conventionally with coagulation and flocculation, followed by chlorination. The treated water is pumped into a 330,000 gallon capacity aboveground storage tank and then distributed to Mancos residents via a network of underground pipes to 577 taps, of which 494 are residential and 83 commercial (Yennerell, 2009).

The average daily demand is 267,738 gallons. Peak usage during the summer is in June with an average of 459,190 gallons per day. The lowest usage month is in March with an average of 175,927 gallons consumed per day. The system has a capacity for providing 900,000 gallons per day (Schmittel, 2008). The Town of Mancos provides an Annual Drinking Water Quality Report to the public which provides information on the results of their water monitoring program. The 2007 report is available at the Mancos Town Office.



PHOTO: COLLEEN WILLIAMS

Figure 12. Water from the West Mancos River is diverted into a settling pond prior to being piped to the water treatment plant.



PHOTO: COLLEEN WILLIAMS

Figure 13. Chris Kramer is the water operator for the Town of Mancos.

## Mesa Verde National Park

Mesa Verde National Park is located in the high plateau country of southwestern Colorado at Latitude 37°20'44"N, Longitude - 108°17'33"W. The park entrance is midway between Cortez and Mancos, off U.S. 160. Mesa Verde National Park occupies 81.4 square miles and offers a spectacular look into the lives of the Ancestral Pueblo people who made it their home for over 700 years, from A.D. 600 to A.D. 1300. Today, the park protects over 4,000 known archeological sites, including 600 cliff dwellings. These sites are some of the most notable and best preserved in the United States. Mesa Verde National Park is administered by the National Park Service, U.S. Department of Interior.



PHOTO: NATIONAL PARK SERVICE

Figure 14. Cliff Palace Anasazi ruins at Mesa Verde National Park.

Mesa Verde provides drinking water to visitors and resident employees of the Park. The water supply consists of two surface water intakes from the West Mancos River watershed. The water intake on the West Mancos River is their primary source and is located in a steep, remote canyon. Their secondary/emergency source is from Jackson Gulch Reservoir that has a storage capacity of 10,000 acre/feet. Raw water is diverted from these sources and delivered via an underground pipeline to the water treatment plant located within the Park boundaries. There, the raw water is treated with microfiltration followed by chlorination. The treated water is pumped into 5 above-ground storage tanks located in 4 areas of the Park with the following capacity: 2,000,000 gallons, 800,000 gallons, 300,000 gallons, 300,000 gallons, and 90,000 gallons. The total water storage capacity is 3,490,000 gallons. The water is distributed throughout the Park via a network of underground pipes to approximately 80 taps, 20 of which are residential (San Miguel, 2000).

Mesa Verde is a seasonal operation. There is minimal water use in the Park during the months of November through April. Most of the use is from May through October. The average daily demand is 61,000 gallons per day. The peak production day during 2008 was 270,000 gallons.



PHOTO: NATIONAL PARK SERVICE

Figure 15. Mesa Verde Water Treatment Plant provides treated water to visitors and employees of the Park.



PHOTO: NATIONAL PARK SERVICE

Figure 16. Chapin Mesa water tanks are used for drinking water storage and fire protection.

## Mancos Rural Water Company

The Mancos Rural Water Company is a private nonprofit company organized in 1968 to supply water to residents of the Mancos Valley in some unincorporated areas of Montezuma County, Colorado. Their surface water source is from Jackson Gulch Reservoir which is filled with water from the West Mancos River. The raw water is diverted from the reservoir outlet works and delivered to the treatment plant via an underground 12-inch pipeline. Raw water at the treatment plant is treated using Direct Multimedia Filtration followed by chlorine disinfection. The treated water is pumped into four above-ground storage tanks with the following capacity: two 50,000 gallon tanks, one 60,000 gallon tank, and one 80,000 gallon tank. The total water storage capacity is 240,000 gallons. The water is distributed to their customers via a network of underground pipes to approximately 493 taps, serving about 1,500 residents. The average daily demand is approximately 160,000 gallons per day (Simmons, 2009).

### Jackson Gulch Reservoir

In 1948, the Department of the Interior's Bureau of Reclamation completed the Mancos Project that resulted in the construction of the Jackson Gulch Dam, reservoir, and diversion canals. Water from the West Mancos River is diverted through a concrete head gate structure and transported southwesterly for 2.6 miles along the inlet canal into Jackson Gulch Reservoir. Water then exits through an outlet gate on the east side of the dam and returns flows south and east down the outlet canal for 2.2 miles to the West Mancos River. The Jackson Gulch Dam is an off-stream facility and does not have a spillway (USBR, 2008).



SOURCE: BUREAU OF RECLAMATION

Figure 17. The Jackson Gulch Dam is an earth-fill structure standing 180 feet high with a top width of 35 feet and a length of 1900 feet.

Jackson Gulch Reservoir has a total capacity of 10,000 acre-feet. The fluctuation of the surface elevation of the Jackson Gulch Reservoir varies greatly from year to year depending on water demand and runoff. The reservoir is typically filled in the spring with drawdown occurring gradually through the summer.

The Mancos Project provides water for three primary purposes:

1. Irrigation use - Water is provided to agricultural consumers who enhance the economy through the production of crops inclusive of alfalfa, grass hay, irrigated pasture, wheat, oats, barley, and corn silage.

2. Domestic, Municipal and Industrial use - Domestic water supply is provided to the community of Mancos; the Mesa Verde National Park; the Mancos Rural Water Company; and to ensure a permanent source of domestic water for the future growth of the Mancos Valley.

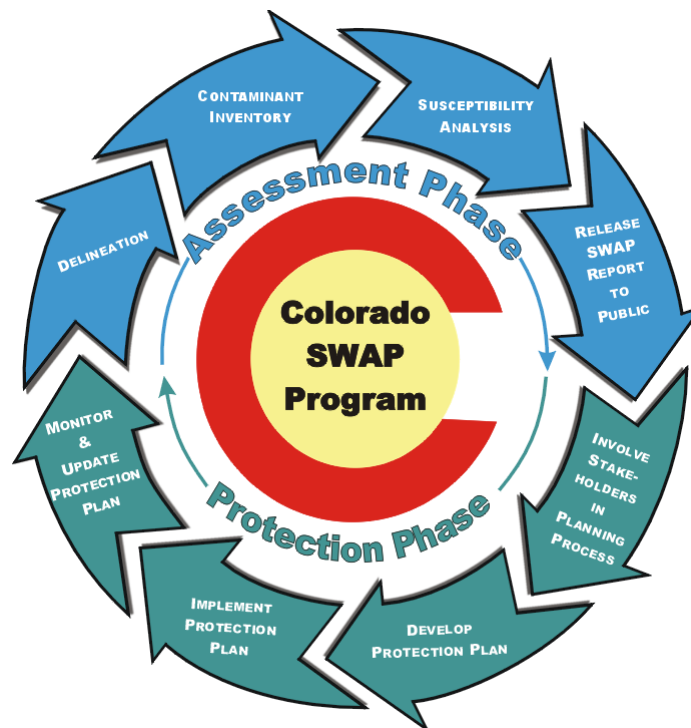
3. Hydroelectric power - The Mancos Water Conservancy District privately constructed and operates a 260-kwh power plant on this project.

## OVERVIEW OF COLORADO'S SWAP PROGRAM

Source water assessment and protection came into existence in 1996 as a result of Congressional reauthorization and amendment of the Safe Drinking Water Act. The 1996 amendments required each state to develop a source water assessment and protection (SWAP) program. The Water Quality Control Division, an agency of the Colorado Department of Public Health and Environment (CDPHE), assumed the responsibility of developing Colorado's SWAP program. The SWAP program protection plan will be integrated with the existing Colorado Wellhead Protection Program that was established in amendments made to the federal Safe Drinking Water Act (SDWA, Section 1428) in 1986. Wellhead protection is a preventative concept that aims to protect public groundwater wells from contamination. The Wellhead Protection Program and the SWAP program have similar goals and will combine protection efforts in one merged program plan.

Colorado's SWAP program is a two-phased process designed to assist public water systems in preventing potential contamination of their untreated drinking water supplies. The two phases include the Assessment Phase and the Protection Phase as depicted in the upper and lower portions of Figure 18, respectively.

Figure 18. Source Water Assessment and Protection Process



### **Source Water Assessment Phase**

As depicted in the upper portion of Figure 18, the Assessment Phase for all public water systems consists of four primary elements.

1. Delineating the source water assessment area for each drinking water source;
2. Conducting a contaminant source inventory to identify potential sources of contamination within each of the source water assessment areas;
3. Conducting a susceptibility analysis to determine the potential susceptibility of each public drinking water source to the different sources of contamination and;
4. Reporting the results of the source water assessment to the public water systems and the general public.

The Assessment Phase involves understanding where the Mancos Valley community source water comes from, what contaminant sources potentially threaten the water source(s), and how susceptible each water source is to potential contamination. The susceptibility of an individual water source is analyzed by examining the properties of its physical setting and potential contaminant source threats. The resulting analysis calculations are used to report an estimate of how susceptible each water source is to potential contamination.

### **Source Water Protection Phase**

The Protection Phase is a voluntary, ongoing process in which the Mancos Valley community has been encouraged to voluntarily employ preventive measures to protect their water supply from the potential sources of contamination to which it may be most susceptible. The Protection Phase can be used to take action to avoid unnecessary treatment or replacement costs associated with potential contamination of the untreated water supply. Source water protection begins when local decision-makers use the source water assessment results and other pertinent information as a starting point to develop a protection plan. As depicted in the lower portion of Figure 18, the source water protection phase for all public water systems consists of four primary elements.

1. Involving local stakeholders in the planning process;
2. Developing a comprehensive protection plan for all of their drinking water sources;
3. Implementing the protection plan on a continuous basis to reduce the risk of potential contamination of the drinking water sources; and
4. Monitoring the effectiveness of the protection plan and updating it accordingly as future assessment results indicate.

The water system and the community recognize that the Safe Drinking Water Act grants no statutory authority to the Colorado Department of Public Health and Environment or to any other state or federal agency to force the adoption or implementation of source water protection measures. This authority rests solely with local communities and local governments. The source water protection phase is an ongoing process as indicated in Figure 18. The evolution of the SWAP program is to incorporate any new assessment information provided by the public water supply systems and update the protection plan accordingly.



## SOURCE WATER ASSESSMENT RESULTS

The Colorado Department of Public Health and Environment assumed the lead role in conducting the source water assessments for public water systems in Colorado. The Mancos Valley drinking water providers received their source water assessment report in November 2004 and have reviewed the report along with the Source Water Protection Planning Team. These assessment results were used as a starting point to guide the development of appropriate management approaches to protect their source water from potential contamination. A copy of the source water assessment summary report can be obtained by contacting the water system or by downloading a copy from the Colorado Department of Public Health and Environment's SWAP program web site located at: [www.cdphe.state.co.us/wq/sw/swaphom.html](http://www.cdphe.state.co.us/wq/sw/swaphom.html). The following sections provide a brief summary of the main findings from the three component phases of the assessment.

### Source Water Assessment Area Delineation

A source water protection area is the surface and subsurface areas from which contaminants are reasonably likely to reach a water source. Delineation is the process used to identify and map the drainage basin that supplies water to a surface water intake. The purpose of delineating a Source Water Protection Area is to determine the recharge area that supplies water to a public water source. The delineated source water assessment area provides the basis for understanding where the community's source water and potential contaminant threats originate, and where the community has chosen to implement its source water protection measures in an attempt to manage the susceptibility of their source water to potential contamination.

The Mancos Source Water Protection Planning Team reviewed the protection area delineated in the State's Assessment for the three community drinking water providers and found two areas that needed to be added to the delineation. These included the area around the Jackson Gulch Reservoir's outlet canal and the area around the Weber Reservoir inlet ditch that diverts water from upper Middle Mancos River and delivers it to Weber Reservoir. A map of the location of these additional protection areas was presented to the Colorado Department of Public Health and Environment's SWAP program. As a result, the State re-delineated the boundaries of the protection area to include the additions (Figure 19).

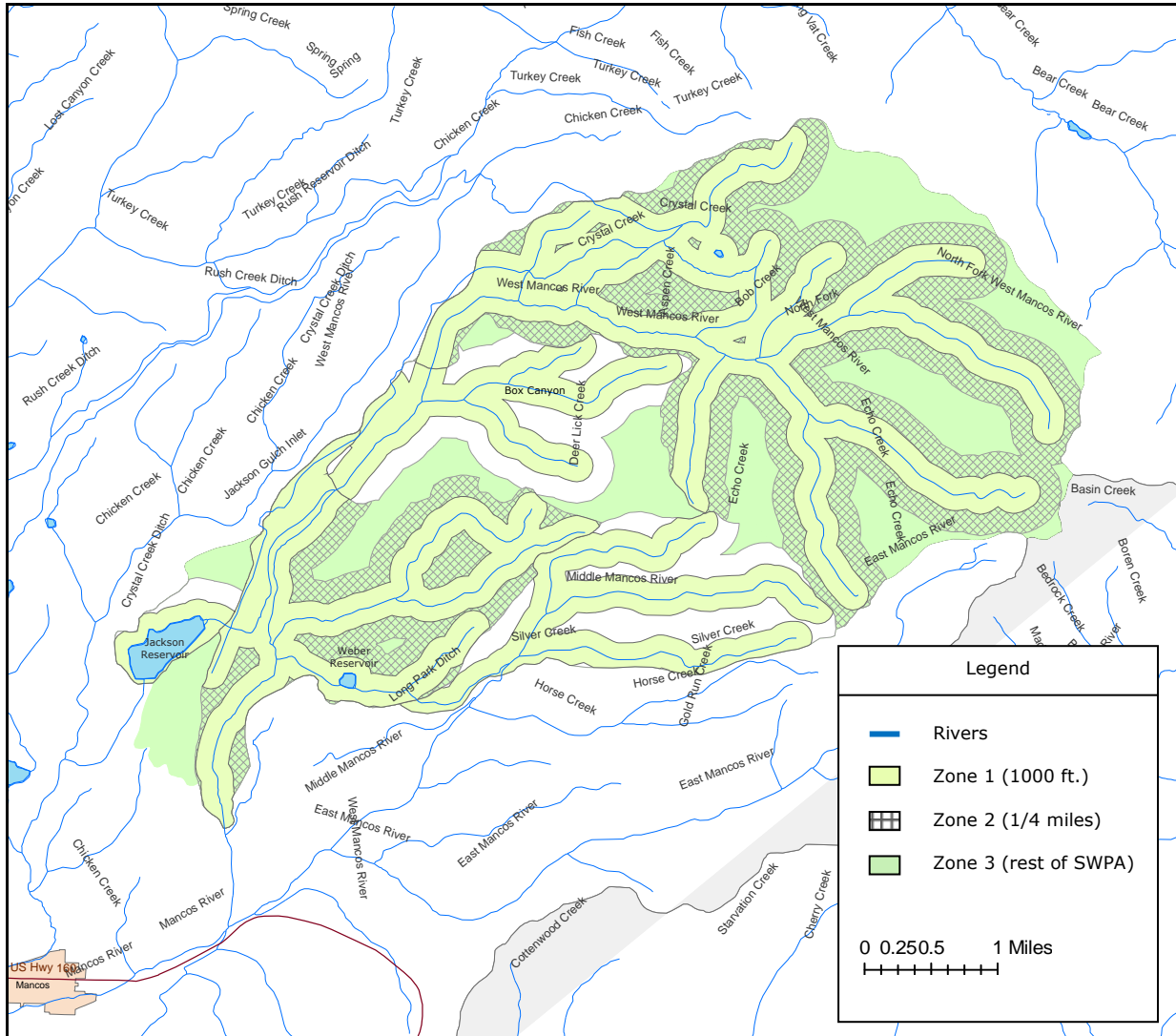
### Surface Water Sources

The Mancos Valley community's source waters are from surface water sources within the same watershed. The location of potential contaminant sources to the surface water drainage network was evaluated using Geographic Information System technology to determine its proximity relative to three sensitivity zones defined as:

- 1) **Zone 1** was located 1,000 feet on either side of the surface water drainage network.
- 2) **Zone 2** extended outward a distance of one-quarter mile from the boundary of Zone 1.
- 3) **Zone 3** included the rest of the source water assessment area that was not covered by either Zone 1 or Zone 2.

# Delineation of the Source Water Protection Area

Figure 19. Map of the Re-delineated Source Water Protection Area



SOURCE: COLORADO WATER QUALITY CONTROL DIVISION

## **Contaminant Source Inventory**

### Notice

*The information contained in this "Plan" is limited to that available from public records and the water supplier. Other "potential contaminant sites" or threats to the water supply may exist in the source water assessment area that are not identified in this "Plan." Identification of a site as a "potential contaminant site" should not be interpreted as one that will necessarily cause contamination of the water supply.*

In 2001-2002 a contaminant source inventory was conducted by the Colorado Department of Public Health and Environment to identify selected potential sources of contamination that might be present within the source water assessment areas. Discrete contaminant sources were inventoried using selected state and federal regulatory databases. Dispersed contaminant sources were inventoried using a recent land use/land cover and transportation maps of Colorado, along with selected state regulatory databases. The contaminant inventory was completed by mapping the potential contaminant sources with the aid of a Geographic Information System (GIS).

The results were provided to the water systems as part of the source water assessment process. The Mancos Valley water providers were asked to voluntarily review the inventory information, field-verify selected information about existing and new discrete contaminant sources, and provide feedback on the accuracy of the inventory.

The WQCD's assessment process used the terms "discrete" and "dispersed" potential sources of contamination. A discrete source is a facility that can be mapped as a point, while a dispersed source covers a broader area such as a type of land use (crop land, forest, residential, etc.). Contaminant health concerns for the discrete and dispersed sources of contaminants are included in the Appendices of this report.

### **Discrete Potential Sources of Contamination**

The contaminant source inventory results for the 3 community water suppliers indicate one type of discrete potential source of contamination: 11 inactive abandoned mine sites

### **Dispersed Potential Sources of Contamination**

The contaminant source inventory indicates the following types of dispersed contaminant sources were identified within the source water assessment areas analyzed:

Land uses identified in the State's Assessment:

- Pasture/Hay
- Row Crop
- Deciduous Forests
- Evergreen Forests
- Mixed Forests
- Septic Systems
- Oil/Gas Wells
- Road Miles

## Contaminants Health Concerns

The discrete and dispersed sources of contaminants can cause acute and chronic health concerns as indicated below. These categories of contaminants are most likely associated with the most prevalent sources identified in Table 8.

### Acute Health Concerns

Acute health concern contaminants include individual contaminants and categories of constituents that pose the most serious immediate health concerns resulting from short-term exposure to the constituent. Many of these acute health concern contaminants are classified as potential cancer-causing (i.e., carcinogenic) constituents or have a Maximum Contaminant Level Goal (MCLG) set at zero (0).

Table 8. Acute Health Concerns

Acute Health Concern	Discrete Contaminants	Dispersed Contaminants
Microorganisms	x	x
Nitrate/Nitrite	x	x
Pesticides	x	x
Semi-volatile organic compounds (SVOCs)	x	
Volatile organic compounds (VOCs)	x	
Lead	x	
Ammonia or nitric acid	x	x

SOURCE: COLORADO WATER QUALITY CONTROL DIVISION

### Chronic Health Concerns

Chronic health concern contaminants include categories of constituents that pose potentially serious health concerns due to long-term exposure to the constituent. Most of these chronic health concern contaminants include the remaining primary drinking water contaminants.

Table 9. Chronic Health Concerns

Acute Health Concern	Discrete Contaminants	Dispersed Contaminants
Herbicides	x	x
Pesticides		x
Volatile organic compounds (VOCs)	x	
Non-metal inorganic compounds		
Metals – Primary Drinking Water (other than lead)	x	
Turbidity	x	x
Other inorganic compounds	x	x
Other organic compounds	x	

SOURCE: COLORADO WATER QUALITY CONTROL DIVISION

## Susceptibility Analysis

*Notice: The susceptibility analysis provides a screening-level evaluation of the likelihood that a potential contamination problem could occur rather than an indication that a potential contamination problem has or will occur. The analysis is NOT a reflection of the current quality of the untreated source water, nor is it a reflection of the quality of the treated drinking water that is supplied to the public.*

The susceptibility analysis was conducted by the Colorado Department of Public Health and Environment to identify how susceptible an untreated water source could be to contamination from potential sources of contamination inventoried within its source water assessment area. The analysis looked at the susceptibility posed by individual potential contaminant sources and the collective or total susceptibility posed by all of the potential contaminant sources in the source water assessment area. The Colorado Department of Public Health and Environment developed a susceptibility analysis model for surface water sources and ground water sources under the influence of surface water, and another model for ground water sources. Both models provided an objective analysis based on the best available information at the time of the analysis. The Colorado Department of Public Health and Environment provided the three Mancos Valley water providers with a final source water assessment report and supporting analysis information.

Table 9 summarizes the total susceptibility and physical setting vulnerability results, and the individual susceptibility results for the discrete and dispersed contaminant sources associated with each of the water sources identified in the assessment reports.

An explanation of the rating system used in Table 10 includes:

- 1) **Overall Susceptibility Rating** - This rating is based on two components: the physical setting vulnerability of the water source and the contaminant threat.
- 2) **Physical Setting Vulnerability Rating** - This rating is based on the ability of the ground water flow to provide a sufficient buffering capacity to mitigate potential contaminant concentrations in the water source.
- 3) **Land Uses (Dispersed Potential Sources of Contaminants) Susceptibility Ratings** - This summarizes those land uses that the WQCD's assessment considered to represent the highest threats to the water source.

Table 10. Table of Susceptibility Results and Contaminant Source Inventory

<b>Public Water System</b>	<b>Town of Mancos</b>	<b>Mancos Rural Water Company</b>	<b>Mesa Verde National Park</b>
Public Water System Identification #	CO0142700	CO0142600	CO0142750
Drinking Water Source	West Mancos River Jackson Gulch Reservoir	Jackson Gulch Reservoir	West Mancos River Jackson Gulch Reservoir
Source Type	Surface Water	Surface Water	Surface Water
<b>OVERALL SUSCEPTIBILITY RATING</b>			
	1-Moderately Low 1-Moderate	1-Moderately Low	1-Moderately Low 1-Moderately Low
<b>PHYSICAL SETTING VULNERABILITY RATING</b>			
	1-Moderately Low 1-Moderate	1-Moderately Low	1-Moderately Low 1-Moderate
<b>DISCRETE CONTAMINANT SOURCES</b>			
Existing/Abandoned Mine Sites	X	X	X
<b>DISPERSED CONTAMINANT SOURCES</b>			
Pasture/Hay	X	X	X
Road Miles	X	X	
Forests: Deciduous, Mixed, & Evergreen	X	X	X
Row Crops	X	X	X
Oil & Gas Wells	X		
Septic Systems	X		

SOURCE: COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

## Discussion of Issues of Concern

The Planning Team reviewed the information presented in the State's assessment, discussed other potential sources of contaminants not included in the assessment, and identified areas of concern within the source water protection areas in which to focus their management approaches.

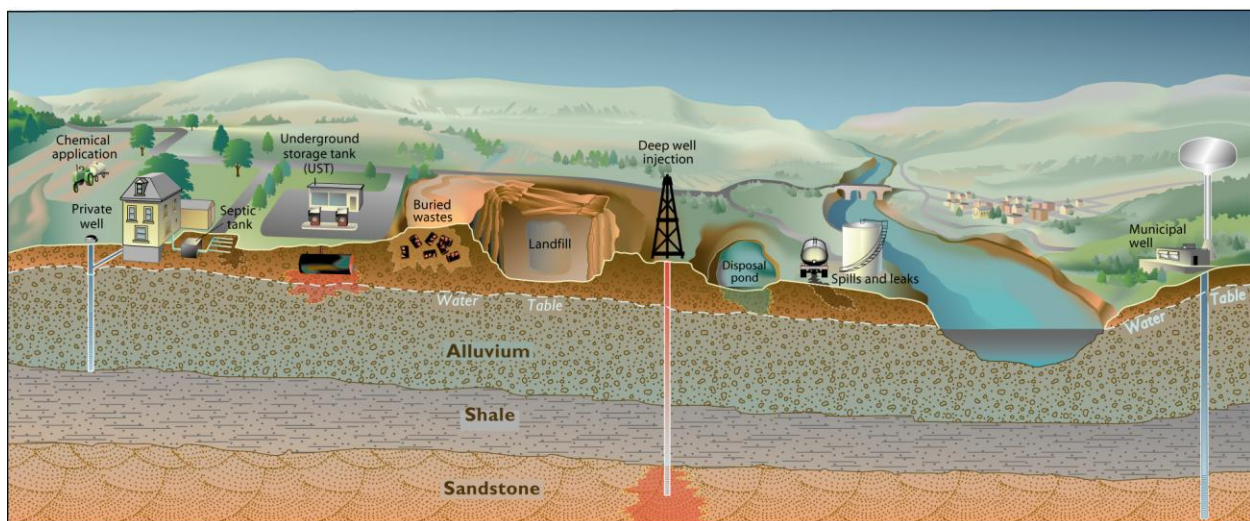
Issues of concern include:

- Roads: spills and sediment
- Land use: growth and development
- Agricultural practices
- Mining activity
- Zebra and Quagga Mussels
- Regional air pollution
- Oil/gas development and pipeline
- Public lands
- Septic systems
- Residential practices

### Surface and Ground Water Contaminants

Many types of land uses have the potential to contaminate source waters: spills from tanks, trucks, and railcars; leaks from buried containers; failed septic systems, buried or injection of wastes underground, use of fertilizers, pesticides, and herbicides, road salting, and polluted urban and agricultural runoff. While catastrophic contaminant spills or releases can wipe out a water resource, ground water degradation can result from a plethora of small releases of harmful substances. According to the USEPA, nonpoint-source pollution (when water runoff moves over or into the ground picking up pollutants and carrying them into surface and ground water) is the leading cause of water quality degradation (GWPC, 2008).

Figure 20. Schematic drawing of the potential sources of contaminants to surface and ground water.



SOURCE: GROUND WATER ATLAS OF COLORADO

## Discussion of Issues of Concern

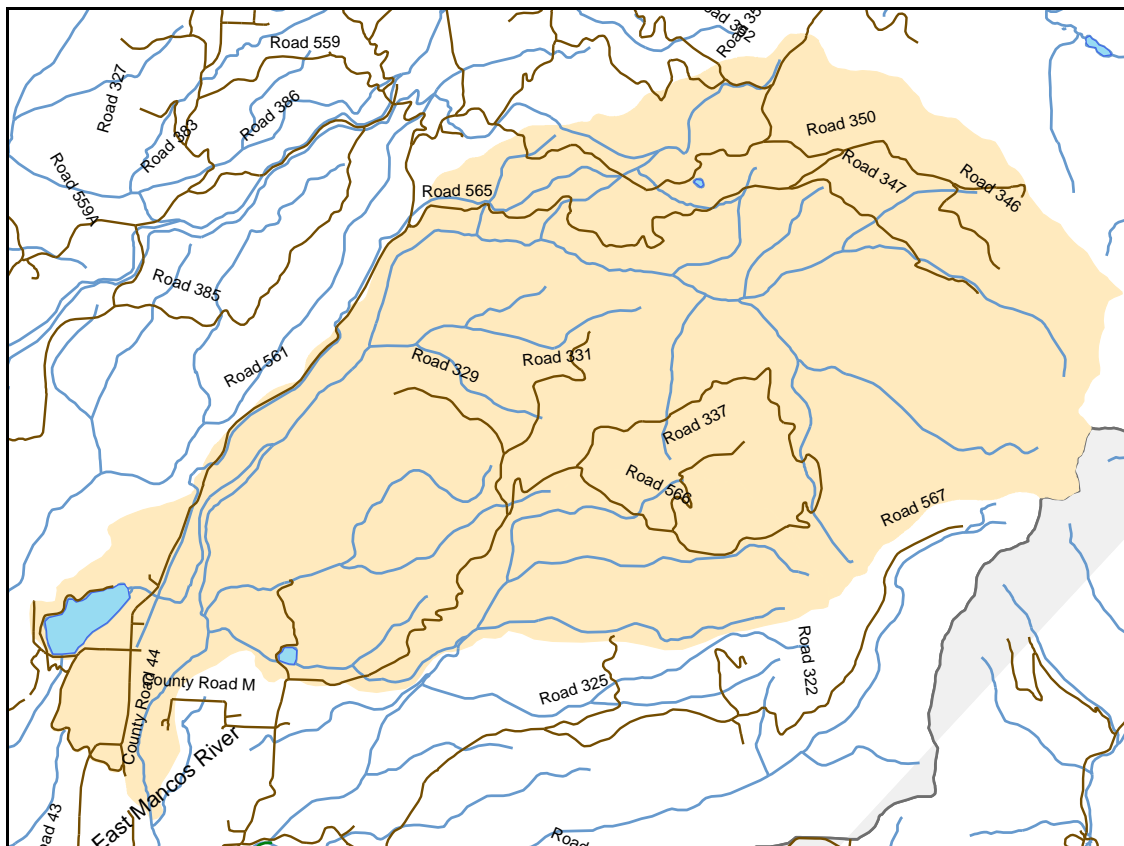
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### Roads: Spills and Sediment

The source water protection area is served by a small network of natural surface forest routes and county roads. The proximity of these routes to the source waters is illustrated in Figure 21 below. Within this rural area, spills may occur from trucks that transport fuels, waste, and timber potentially contaminating the source waters. The Planning Team recommends educating the public on how to respond to a hazardous spill as well as working with local emergency response teams to ensure that any spills within the protection areas be effectively contained and remediated.

The construction and maintenance of roads has been recognized as a potential source of sediment in forested watersheds. Roads can change natural run-off patterns by increasing the amount of impervious surface in a watershed, intercepting overland flow, and routing this water directly into streams. Sediment is the major pollutant associated with roads on public lands. Sediment loading into streams can result in impacts to the ecological health of the stream as well as higher water treatment costs for public water suppliers (SJNF, 2008). The Planning Team recommends the use of proper road BMPs and management approaches to prevent the transport of sediment into the stream system.

Figure 21. Road system within the source water protection area





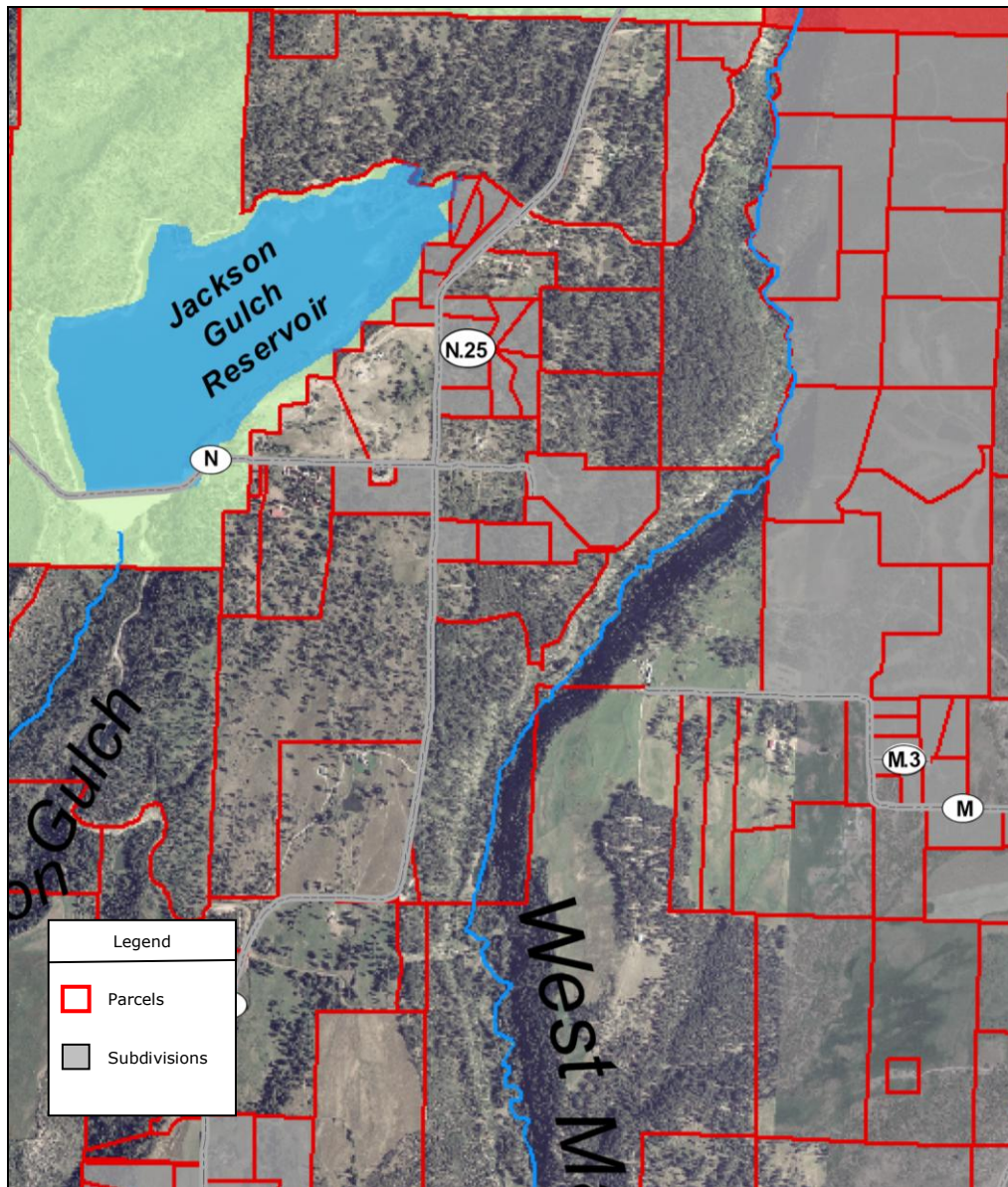
## Discussion of Issues of Concern

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### Land Use: Growth and Development

Currently, the State of Colorado law allows the subdivision of property into lots with a minimum of 35 acres without county review. There are large land tracts within the protection area that could be divided into these 35 acre parcels as indicated in the map of private property parcels within the Source Water Protection Area (Figure 22). Future land use and growth within the protection area and the potential for water quality impacts from these changes is a concern to the Planning Team. The Team recommends that decision makers within Montezuma County be encouraged to consider source water protection when they make land use decisions including additional subdivision in this area.

Figure 22. Map of private property parcels within the protection area



SOURCE: MONTEZUMA COUNTY

## Discussion of Issues of Concern

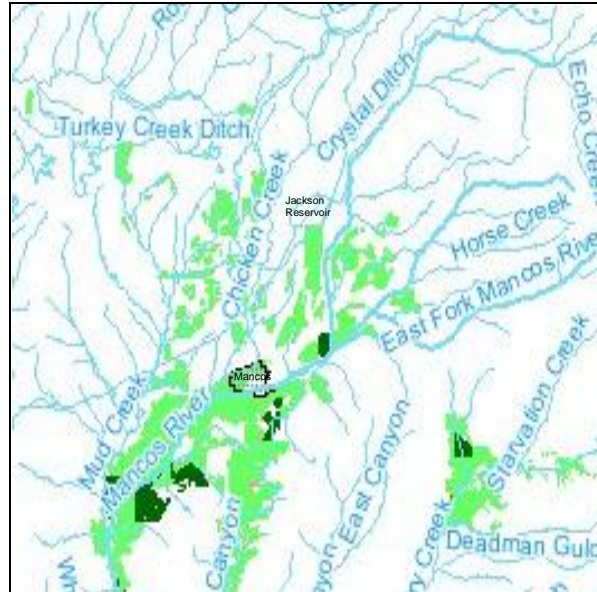
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### Agricultural Practices

#### Irrigated Fields

The State has identified hay fields as a potential source of contaminants to the source waters. Agricultural lands lie within the 1000 foot Zone 1 protection zone southeast of Jackson Reservoir along West Mancos River. Excess fertilizer use and poor application methods can cause fertilizer movement into surface and ground waters. The two main components of fertilizer that are of greatest concern to source water quality are nitrogen and phosphorus.

The Planning Team recommends public education to encourage agricultural BMPs that protect water sources including the proper application and storage of fertilizers, irrigation techniques, and placement of manure.



SOURCE: COLORADO DIVISION OF WATER RESOURCE

Figure 23. Map of irrigated lands showing grass pasture as light green and alfalfa fields as dark green.

#### Livestock Grazing

Livestock grazing occurs within the private and public lands in the watershed. On public lands within the San Juan National Forest livestock operators are authorized grazing use on areas called allotments through an approved grazing permit/lease. Grazing is managed by the terms and conditions specified for each allotment on permit/lease, e.g., kind and number of livestock, season of use, and amount of use permitted each grazing year. Permit/leases are generally issued for a term of 10 years. When they expire, before being renewed they undergo a review for conformance with land use plans and compliance with environmental documentation requirements.

Within the San Juan National Forest, livestock grazing can impact riparian health, stream-channel conditions, upland infiltration and erosion, and water quality. The most common livestock-caused impacts include fecal/bacterial contamination, sedimentation, and increased temperatures. Livestock grazing activities with the highest potential for direct and indirect impacts to water resources include long-term concentrated grazing in riparian areas, and trampling/trailing near water sources. Direct bank damage may add large amounts of sediment directly into streams, especially in wet meadow streams or erosive topography that is prone to gully formation. Free livestock access to streams and riparian areas can be a major source of pathogens to surface water (i.e. E. coli and Cryptosporidium).

The Planning Team recommends obtaining a map of the grazing allotments and schedule of use within the watershed, monitoring riparian and water quality health impacts on forest lands within the watershed, and encouraging BMPs to minimize source water impacts.

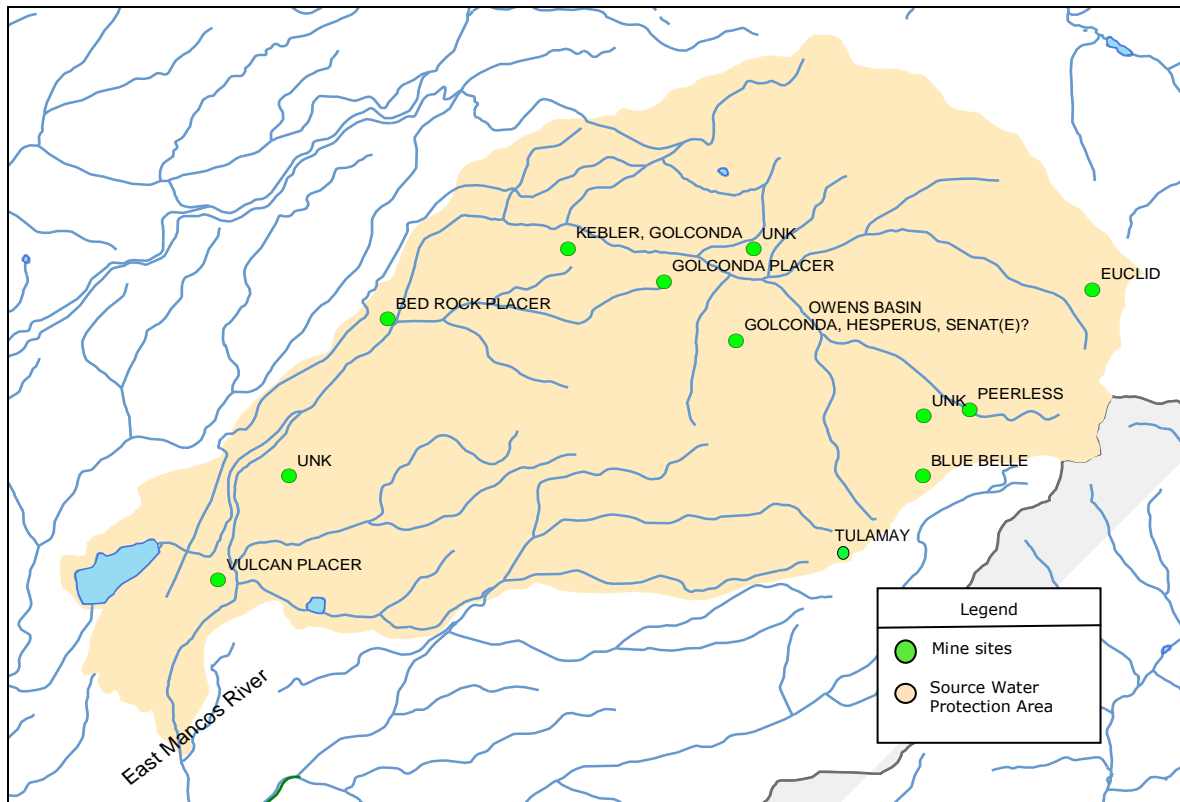
## Discussion of Issues of Concern

### Mining Activity

Active and inactive mining operations have a potential to contaminate drinking water supplies from either point source discharges (i.e. mine drainage tunnels or flowing adits) or nonpoint source discharges from run-off over tailings piles. The State's Source Water Assessment identified 12 inactive or abandoned mines within the protection area (Figure 24). The Forest Service also added the Owen Basin Trail tailings pile site to the list. There is very little information on these historic mining activities. Currently, there are no active mining permits in the protection area. There are some small prospecting activities on the West Mancos River which consists of sluicing loose material for gold, which does not require permits.

Further assessment of these mine sites and water quality monitoring downstream of these sites may help to determine their potential for contaminating the source waters. The Planning Team recommends working with the Colorado Division of Mines, Reclamation, and Safety, Mancos Conservation District, Mancos Valley Watershed Project, and the U.S. Geological Survey on assessment and monitoring.

Figure 24. Map of mine sites from the State's Source Water Assessment



SOURCE: COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

## Discussion of Issues of Concern

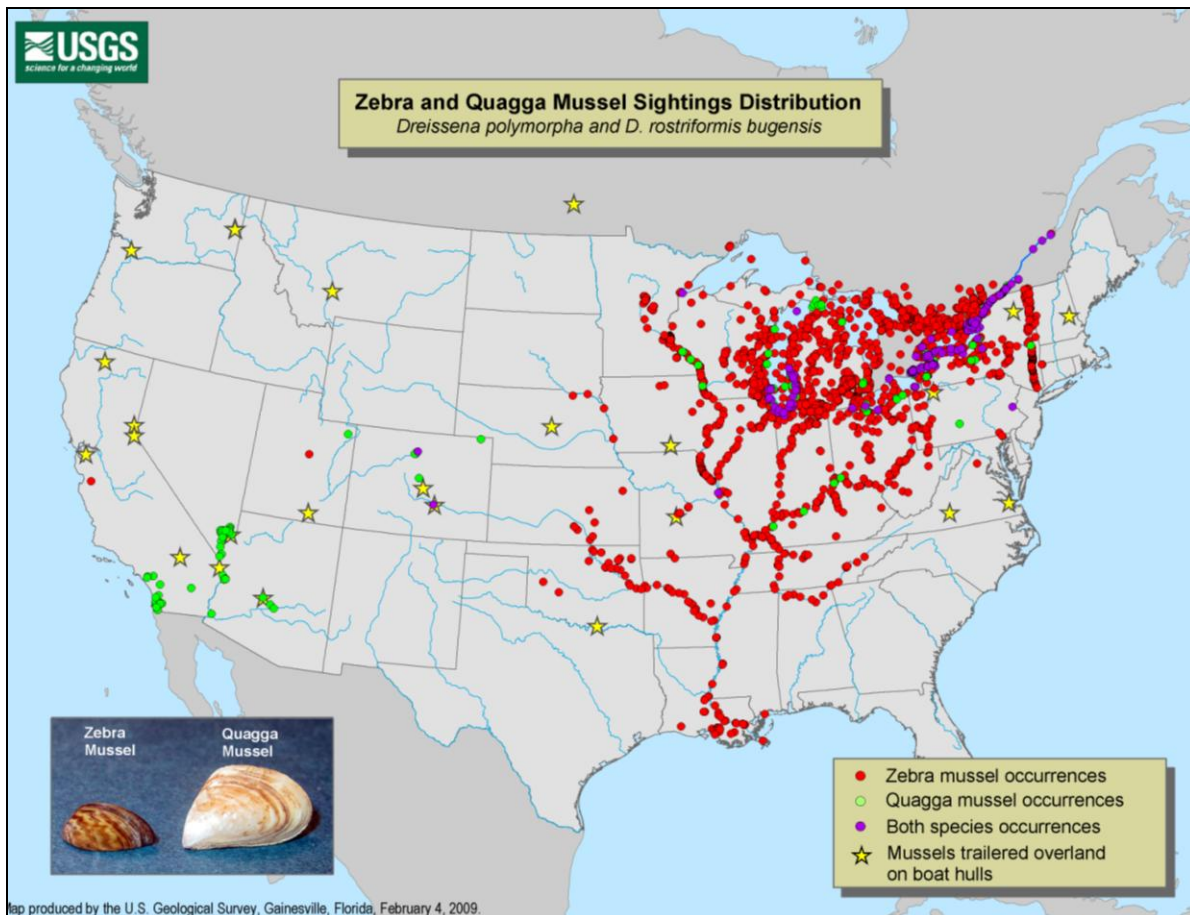
### Zebra and Quagga Mussels

The introduction and spread of the invasive aquatic species zebra mussel (*Dreissena polymorpha*) and quagga mussel (*Dreissena rostriformis bugensis*) into the waters of Colorado is a concern for drinking water suppliers. The zebra and quagga mussels are invasive nonnative freshwater bivalve mollusks. They can be differentiated by morphological differences of their shell. The zebra mussel is more triangular in shape, usually have a striped pattern on their shells and average one inch in length. The quagga has a rounded carina, slightly larger than the zebra mussel and paler toward the hinge.

#### Location of Invasive Species

Both species of mussels were originally native to the lakes of southeast Russia and were accidentally introduced into other countries from ocean-going ships. The mussels were first discovered in the United States in the Great Lakes in 1988 and spread to a large number of waterways throughout the country (Figure 25).

Figure 25. Map of zebra and quagga mussel sightings distribution



## Discussion of Issues of Concern

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During 2008, the zebra and quagga mussels were found in seven lakes and reservoirs of the three major river systems throughout Colorado (Table 11).

Table 11. Location of zebra and quagga mussels in Colorado

Water Body	River System	Zebra Mussel	Quagga Mussel
Grand Lake	Colorado River headwaters	x	x
Pueblo Reservoir	Arkansas River west of Pueblo	x	x
Lake Granby	Colorado River headwaters		x
Shadow Mountain Reservoir	Colorado River headwaters		x
Willow Creek Reservoir	Colorado River headwaters		x
Tarryall Reservoir	South Platte River headwaters		x
Julesburg Reservoir (Jumbo Lake)	South Platte River		x

SOURCE: U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION AND U.S. GEOLOGICAL SURVEY

### Impacts to Water Bodies

Both species of mussels are prolific breeders, thus contributing to their spread and abundance. A fully mature female mussel is capable of producing up to one million eggs per season. Their larvae are microscopic. These invasive mussels smother other aquatic organisms and compete with native species for food and habitat. Their massive colonies can clog water intake structure, such as pipes and screens, therefore reducing pumping capabilities for power and water treatment plants, costing industries, companies, and communities. Recreation-based industries and activities have also been impacted; docks, breakwalls, buoys, boats, and beaches have all been heavily colonized. The mussels attach themselves to hard surfaces and are difficult to remove. They can withstand short periods (several days) out of the water if conditions are moist and humid.

Many of the potential impacts of these species are unclear due to the limited time scale of North American colonization. Nonetheless, it is clear that there is a high potential for rapid adaptation to extreme environmental conditions possibly leading to significant long-term impacts on North American waters (USGS, 2009).

The Planning Team is concerned with the potential introduction of these mussels into Jackson Gulch Reservoir. The reservoir is a popular recreational spot for canoeing, kayaking, wakeless power boating, and fishing with about 36,000 visitors per year. Recreation at Jackson Gulch Reservoir (Mancos State Park) is managed by the Colorado Division of Parks and Outdoor Recreation under agreement with the Bureau of Reclamation, Western Colorado Area Office - Southern Division, Durango, Colorado.

Many efforts are underway to contain or control the spread of these invasive species. Signage at the reservoir educates recreational users about the mussels and how to prevent transmission of them into the reservoir. The Planning Team recommends a public education effort to encourage recreational boaters and fishermen to clean their boats and equipment before transporting them to new waters. This includes the disposal of any live bait also.

## Discussion of Issues of Concern

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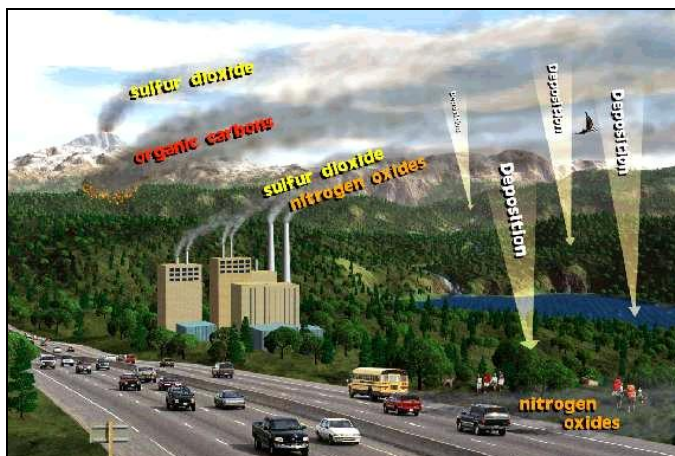
### Regional Air Pollution

Air quality issues in the Four Corners Region prompted the formation of the Four Corners Air Quality Task Force (Task Force) that convened November 2005. The Task Force was comprised of more than 100 members including private citizens, universities, industry, and federal, state, tribal and local governments. The Task Force discussed the impacts that oil and gas production, existing and planned coal-fired power plants, growth and other factors are having on air quality in the Four Corners Region. The task force concluded a two-year effort in November 2007 with the finalization of a report on a broad list of options for improving air quality in the region. The report is a resource for regulatory agencies to manage air quality impacts and is included in the Appendices of this report. The task force reconvenes periodically to check on progress (CDPHE, 2008).

### Pollutants of Concern

Ozone, nitrates and particulate matter are of particular concern in the region due to increased oil and gas operations, power plants, and general growth. These pollutants impair visibility and affect other sensitive resources such as water quality and ecosystems in the region

Another pollutant of concern is mercury that is released into the environment from industrial operations including coal-fired power plants. Air quality monitoring at Mesa Verde National Park has shown extremely high levels of mercury. The U.S. Geological Service has found elevated mercury levels in lakes and reservoirs in Southwest Colorado as the result of air borne-deposition. Mercury concentrations in sport fish from several reservoirs have exceeded the 0.5 microg/g action level resulting in mercury fish consumption advisories for McPhee, Narraguinnep, Navajo, Sanchez and Vallencito Reservoirs. Mercury deposition may be deposited at higher concentrations in the mountains because of the greater rates of precipitation and the process of cold condensation, which causes volatile compounds to migrate towards colder areas at higher elevation and latitude (FCAQTF, 2007). Although there have been no studies to determine if the fish in Jackson Lake Reservoir also have high levels of mercury, the source waters for the protection area are at risk due to their location in relation to the regional air quality problem. Furthermore, any additional coal-fired power plants in the region would have the potential to elevate ozone and mercury levels even higher.



SOURCE: CDPHE, NPS PROGRAM

Figure 26. Schematic drawing of the emissions of pollutants from a power plant and the deposition to water sources.

## Discussion of Issues of Concern:

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### Oil and Gas Development

The oil and gas industry in Colorado is regulated by the Colorado Oil and Gas Conservation Commission (COGCC). The mission of the COGCC is: To promote responsible development of Colorado's oil and gas natural resources. Responsible development results in:

- The efficient exploration and production of oil and gas resources in a manner consistent with the protection of public health, safety and welfare
- The prevention of waste
- The protection of mineral owners' correlative rights
- The prevention and mitigation of adverse environmental impacts

The COGCC seeks to serve, solicit participation from, and maintain working relationships with all those having an interest in Colorado's oil and gas natural resources (COGCC, 2008). The COGCC's website, [www.cogcc.state.co.us](http://www.cogcc.state.co.us), provides updated information on the location and status of oil and gas operations throughout Colorado. The public can also access this website to find out information regarding violations and complaints of well permit holders. Permit holders are required by State law to comply with the rules and regulations of the COGCC.

#### New Rules Protect Source Waters

The Colorado legislature passed House Bill 1341 in spring 2007 to increase environmental and public health protections in the face of unprecedented oil and gas development. House Bill 1341 directed the Colorado Oil and Gas Conservation Commission to make and enforce rules consistent with the protection of the environment, wildlife resources, and public health, safety, and welfare. In 2008, the COGCC developed and passed new rules that may become effective on May 1, 2009 on federal land and April 1, 2009 on all other land.

One of the new rules, Rule 317, protects public water systems by protecting the source of their drinking water. It creates protection zones, or buffer zones, combined with performance requirements applicable within 5 miles upstream of the surface water intake. The most protected Internal Buffer Zone is located within 300 feet of a water segment and is a drilling excluding zone. The purpose for protecting this zone is that a significant release in these areas would likely contaminate surface water used as a drinking water source. The Commission also decided that enhanced drilling and production requirements should apply in areas ½ mile from the water supply segment, in an Intermediate and Extended Buffer Zone. The Rule 317 buffer zones are identified on the map in Figure 27.

In order to balance protection of drinking water with development of energy resources, the Commission included allowances for oil and gas operations that existed prior to the rulemaking that are within the Internal Buffer Zone to remain in place and to expand these operations under certain conditions. The Commission also established rule provisions for those situations where a variance can be requested for placement of new oil and gas operations in the Internal Buffer Zone (COGCC, 2008)

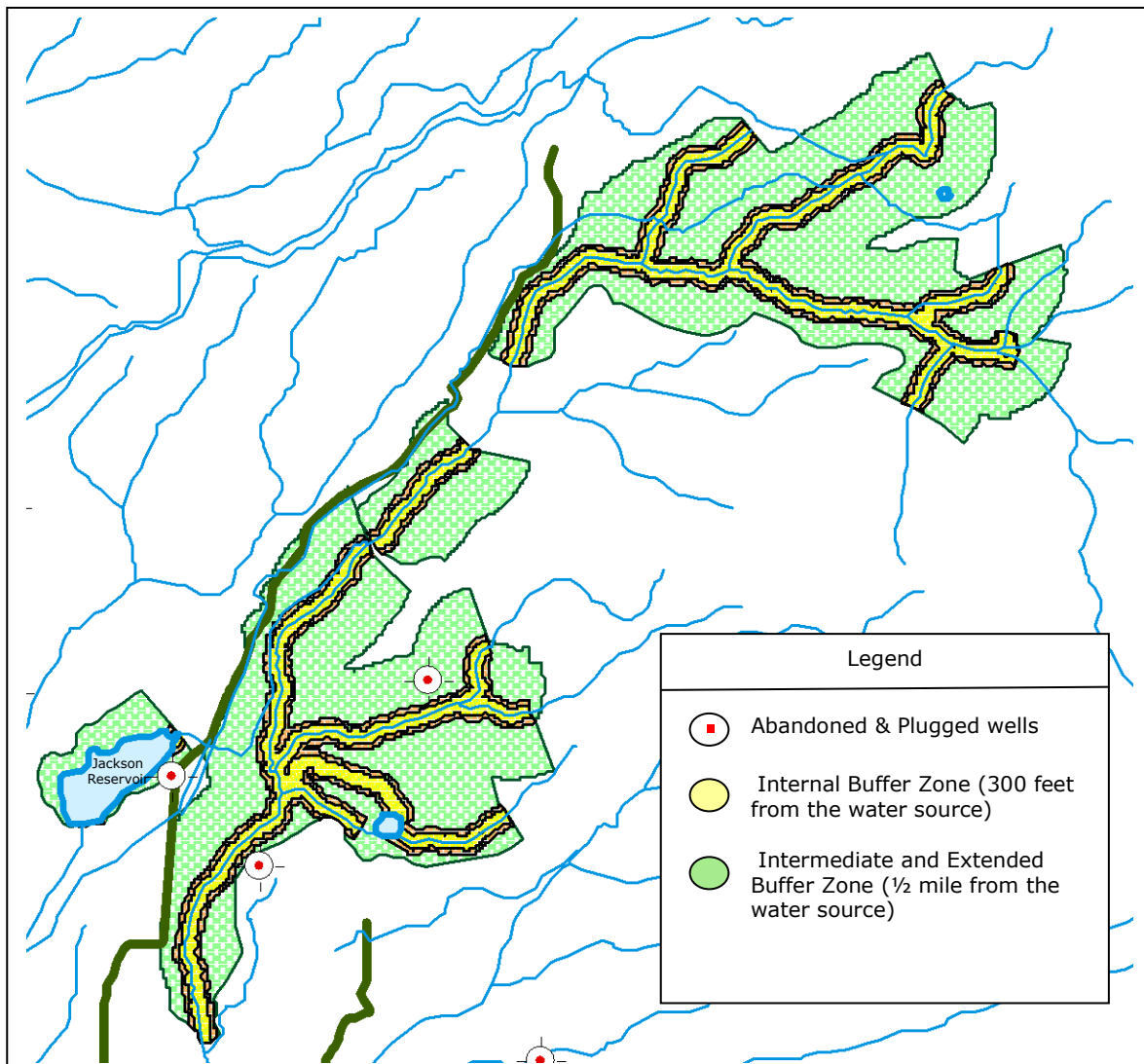
## Discussion of Issues of Concern

### Oil and Gas Development in the Source Water Protection Area

Although many areas of the State of Colorado are experiencing an oil and gas boom, there is currently no oil and gas drilling within the source water protection area. There are no proposed leases in the protection area and no new or pending permits (COGCC, 2008). Historically, there are three wells within the protection area that were abandoned and plugged. The location of these historic wells is identified on the map below and information about these wells is included in the appendices of this report.

The potential for oil and gas development in the protection area is low, but may change in the future based on economic and resource needs. Future oil and gas operations within the protection area will be subject to COGCC's Rule 317 which creates protection zones identified in Figure 27.

Figure 27. Location of COGCC zones and historic oil and gas wells



SOURCE: COLORADO OIL AND GAS CONSERVATION COMMISSION



## Discussion of Issues of Concern

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### TransColorado Pipeline

The TransColorado Pipeline is a natural gas pipeline system that extends from Rio Blanco County, Colorado to connect with the El Paso Natural Gas Company and Transwestern Pipeline Company in San Juan County, New Mexico. The pipeline crosses West Mancos Canyon in the source water protection area in a north to south direction. The 292-mile pipeline is approximately 8 years old and is installed 6-8 feet underground. The pipeline is a strategic outlet for natural gas produced in the Rocky Mountain supply basins.



SOURCE: KINDER MORGAN INC.

Figure 28. TransColorado Pipeline installation

There may be additional pipelines constructed along the same corridor in the future with the increase in energy development throughout Colorado. Dense pipeline infrastructure increases the risk of spills from pipeline failure, and may contaminate surface and ground water. Pipeline operating conditions are monitored 24 hours a day, 7 days a week by personnel in control centers using a Supervisory Control and Data Acquisition (SCADA) computer system. Whenever operating conditions change, an alarm warns the operator on duty and the condition is investigated. Both automated and manual valves are strategically placed along the pipeline system to enable the pipeline to be shut down immediately and sections to be isolated quickly, if necessary (Kinder Morgan, 2007).

### The Colorado Oil and Gas Association

The Colorado Oil and Gas Association's (COGA) purpose is to foster and promote the beneficial, efficient, responsible and environmentally sound development, production and use of Colorado oil and natural gas. COGA is a nationally recognized trade association that aggressively promotes the expansion of Rocky Mountain natural gas markets, supply and transportation infrastructure through its growing and diverse membership. COGA leads major legal and regulatory efforts in Colorado affecting industry before the Colorado courts, Colorado Oil and Gas Conservation Commission, Colorado Department of Public Health and Environment, as well as federal agencies (COGA, 2008).

COGA chapters provide an expanded statewide grassroots presence for the industry and the Association in their local communities. The local chapter for the project area is the Western Slope Chapter (Table 12).

Table 12. Contact Information

TOPIC	AGENCY	PHONE #
Oil and Gas Regulations in Colorado	Colorado Oil and Gas Conservation Commission	(303) 861-0362
Local Oil and Gas Association	Western Slope Oil and Gas Association	(970) 630-3242
Dig Safely Program	Utility Notification Center of Colorado	1-800-922-1987
Gas Pipelines	Public Utilities Commission	(303) 894-2000
Geological Maps & Publications	Colorado Geological Survey	(303) 866-2611
Oil and Gas Severance Tax	Department of Revenue	(303) 238-7378
Produced Water Discharge Permits	CDPHE/Water Quality Control Division	(303) 692-3524
Service Stations (Inspections, complaints, etc.)	CDLE/Division of Oil & Public Safety	(303) 318-8507
State Oil and Gas Leases/Auctions	State Land Board	(303) 866-3454
Storage Tanks	CDLE/Division of Oil & Public Safety	(303) 318-8507

## Discussion of Issues of Concern

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### Water Quality Concerns

Many different activities related to oil and gas development may result in a broad spectrum of watershed impacts. Construction of new roads, well pads, pipelines, compressor stations, and other site disturbances would be necessary in order to develop these fluid-mineral resources. Long-term ground disturbances increase the risk of erosion and sediment transport to surface water. Any activity that involves the storage or transport of petroleum, natural gas, chemicals or produced water involves the possibility of these substances escaping into the environment. Well drilling and production may result in spills or releases of drilling fluids, fracturing fluids, produced water, hydrocarbons, or other chemicals transported within the source water protection area. During drilling there could be a release of fluids into the underlying aquifers, potentially contaminating the ground water resources.

Pumping oil and gas out of the ground produces large volume of water, known as produced water or brine due to its high salinity. Dewatering target formations can lead to a connected dewatering of surface seeps, springs, and streams, which may, in turn, impact riparian, wetland, wildlife, and aquatic habitat, as well as human water supplies. Dewatering techniques include re-injecting the produced water into an underground aquifer or surface discharge via a ditch to a nearby creek. The disposal of this brine water to surface water is a concern in the protection area because of the already high salt contribution from the naturally occurring Mancos Formation into the watershed. Well construction in watersheds containing erosive saline soils can produce saline-run-off, which may in turn, increase salt loads in the upper Colorado River (SJNF, 2008).

### Protection Strategies

The Planning Team is concerned about future oil and gas development within the source water protection area and additional pipeline construction. They recommend the following strategies to protect the source waters for the Mancos Valley community:

- Staying informed of any potential oil and gas developments on public lands within the protection area and becoming involved in the public process to encourage BMPs to protect water quality. The Team will request that the BLM and USFS will notify them of any future permit applications on public lands within the protection area.
- Staying informed of any potential oil and gas developments on private lands within the protection area through the use of COGCC's website mapping, contacting the regional COGCC representative, and requesting that the Montezuma County Land Use Department notify the community of upcoming permits within the protection area.
- Send a request to the CDPHE's SWAP program manager to provide the newly delineated boundaries of the protection area to COGCC to ensure that the new protection zones for drinking water sources are available to both the public and industry.
- Encouraging the local community to become actively involved in participating in local and regional oil and gas forums.
- Staying informed on future pipeline construction activity, providing the pipeline company with a copy of the protection plan, and requesting a copy of their spill notification protocol.

## Discussion of Issues of Concern

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### Public Lands

Public lands within the Source Water Protection Area are owned by the federal government with lands managed by the U.S. Department of Agriculture's Forest Service. The source waters for the Mancos Valley community originate on San Juan National Forest land managed by the Dolores Ranger District. These source waters have the greatest potential to be directly affected by land use or forest management activities.



PHOTO: CHRIS SCHULTZ

Figure 29. Moon over San Juan National Forest

The public land managers adhere to the principal of multiple-use management outline by the Federal Land Policy and Management Act. This means that they balance outdoor recreation and preservation of wildlife habitat, air and water, and other scenic and historical values with environmentally responsible commercial development of the land and its resources. The BLM manages 8.4 million acres of public lands in Colorado along with 29 million acres of subsurface mineral estate. The BLM in Colorado administers oil and gas leases on these Federal lands. The BLM reviews and approves permits and licenses from companies to explore, develop, and produce oil and gas and geothermal resources (BLM, 2007).

### Water Quality Concerns

The Planning Team is concerned with potential degradation of water quality from transportation, livestock grazing, mining and oil/gas development previously addressed in this report; and timber harvesting, forest fires, and recreation.

### Timber Harvesting

Forest management activities, such as timber harvesting and fuels management, can potentially generate several forms of non-point pollution. Disturbance of land surfaces from road construction, log landings, and skid trails is the primary cause of sediment transport into streams from this activity. Other potential impacts include: debris from timber harvesting ending up in the stream, oils and fuels used in machinery washing into streams, and an increase in temperature levels as a result of clearing timber along stream banks. Implementing Water Conservation Practices, BMPs, guidelines, and proper design criteria are typically effective in preventing or reducing sediment delivery to water bodies (SJNF, 2008).

### Recreation

The US Forest Service has identified unmanaged off-road-vehicle use as a threat to forested lands and grasslands. Some undesirable impacts include severely eroded soils, user-created unplanned roads, disrupted wetland ecosystems, as well as general habitat destruction and degraded water quality throughout forested lands.

## Discussion of Issues of Concern

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### Forest Fires

Increased fuel buildup from a century of fire suppression has led to fires of unnaturally high intensity, burning hundreds of thousands of acres of forest that could have provided timber for the economy and habitat for wildlife. Water quality and biological diversity have suffered, adding to poor ecosystem health. The challenge of forest managers is to remedy both forest health problems—excessive fuel buildup and watershed degradation—without exacerbating either one (Barker, 1997).



PHOTO: MARK WILLIAMS

Figure 30. Sediment delivered to a stream from fire damaged lands.

The pre-fire treatment of hazardous fuels or fuels reduction can reduce wildfire intensity, thereby reducing erosion potential and sediment pollution. Fuel treatments can cause additional sediment, but only a small fraction of the sediment pulse that follows high intensity wildfire. The San Juan National Forest emphasizes fuels reduction in the wildland-urban interface. In conjunction with the Montezuma County Fire Plan the National Forest focuses on reducing fuel levels in subdivisions and around communities. The Forest also uses prescribed fire as a tool to maintain forest health and diversity. Currently, there is no forest-wide fuels reduction plan for the San Juan National Forest. There is a potential proposal for prescribed burns in the Box Canyon and Rampart areas of the watershed for the purpose of restoring forest health.

The Dolores Ranger District has participated on the Planning Team and has identified management approaches for these forest lands to protect water quality. The Planning Team recommends keeping informed on forest management issues, participating in the forest planning activities, and developing partnerships with forest land managers.

### **Septic Systems**

Currently, there are residences within the Source Water Protection Area with septic systems, also called individual sewage disposal systems (ISDSs). If managed improperly, these residential septic systems can contribute excessive nutrients, bacteria, pathogenic organisms, and chemicals to the groundwater. The Montezuma County Health Department has participated on the Planning Team and reported that there are only a few septic systems in the protection area. The Planning Team recommends developing an inventory of owners of septic systems in the protection area, providing public education on proper septic maintenance, and working closely with the County Health Department.



PHOTO: COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

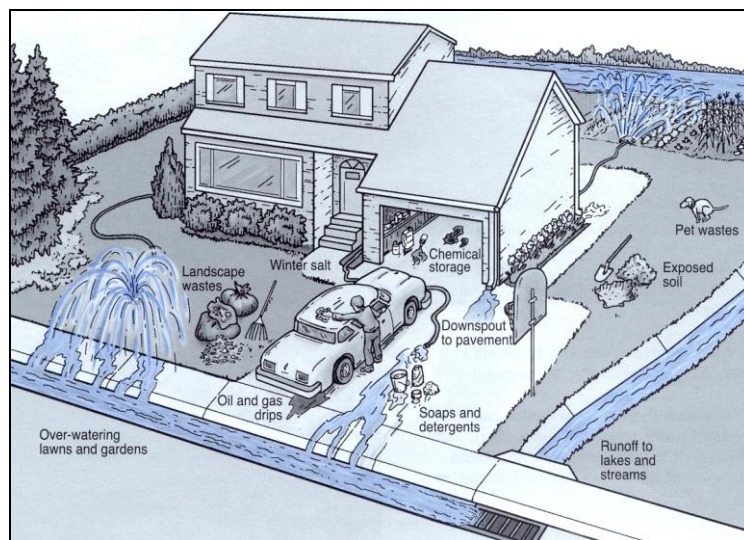
Figure 31. Septic System maintenance is important to the protection of public water supplies.

## Discussion of Issues of Concern

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### Residential Practices

The Mancos Source Water Protection Area includes rural residential dwellings. Common household practices may cause pollutants to runoff residential property and enter the surface or ground water as indicated in the picture below. Prevention of ground water contamination requires education, public involvement, and people motivated to help in the effort. Educating the community and decision makers is one of the challenges and cornerstone of this protection plan. Public education will help people understand the potential threats to their drinking water source and motivate them to participate as responsible citizens to protect their valued resources.



SOURCE: COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Figure 32. Common household practices may cause pollutants to runoff residential property and enter the surface or ground water.

Residents within the source water protection area can help protect their drinking water source by:

- **Using Water Wisely** – Use it sparingly. Check for plumbing leaks, use water-saving showerheads and faucets and water lawns mornings or evenings.
- **Properly Dispose of Chemicals** - Properly dispose of household chemicals like cleaning supplies, paints, solvents and lawn and garden chemicals. Call your local Health Department for disposal options. Don't pour waste chemicals onto the ground or into sinks or toilets.
- **Use Fertilizers, Herbicides and Pesticides Properly** - Apply chemicals according to label instructions and avoid runoff. Do not exceed recommended application rates.
- **"Put Used Oil in Its Place"** - If you change your own motor oil place the used oil in a clean, leak proof, reusable container with a tight-fitting cap. Don't mix oil with water, gasoline, antifreeze, solvents, or other substances. Call 1-800-458-0145 for a collection center near you.
- **Don't Use the Drain** - Do not dispose of automotive chemicals (gasoline, antifreeze, waste oil, brake fluid, cleaning solvents, etc.), paints or other pollutants into floor drains, storm drains or onto the ground. Many floor drains and storm drains discharge directly above groundwater. Wastes discharged onto the ground often seep into groundwater.

## **SOURCE WATER PROTECTION MEASURES**

### **Management Approaches**

The Planning Team reviewed and discussed several possible management approaches that could be implemented within the Source Water Protection Area to help reduce the potential risks of contamination to the community's source water. The Planning Team established a "common sense" approach in identifying and selecting the most feasible source water management activities to implement locally. The focus was on selecting those protection measures that are most likely to work for this project.

The Planning Team recommends the management practices listed in Table 13, "Source Water Protection Best Management Practices" be considered for implementation by:

- Town of Mancos
- Mancos Rural Water Company
- Mesa Verde National Park
- Dolores Public Lands Office (U. S Forest Service Dolores Ranger District and Bureau of Land Management)
- Mancos Valley Watershed Project
- Montezuma County (Government, Land Use, and Health Department)
- Mancos Conservancy District
- Colorado Rural Water Association
- Citizens of the Mancos Valley

### **Evaluating Effectiveness of Management Approaches**

The Mancos Valley community is committed to developing a tracking and reporting system to gauge the effectiveness of the various source water management approaches that have been implemented. The purpose of tracking and reporting the effectiveness of the source water management approaches is to update water system managers, consumers, and other interested entities on whether or not the intended outcomes of the various source water management approaches are being achieved, and if not, what adjustments to the protection plan will be taken in order to achieve the intended outcomes.

The Mancos Valley community is voluntarily committed to applying source water assessment and protection principles to finding and protecting new water sources in the future. This is part of the larger ongoing commitment to providing the highest quality drinking water to their consumers.

The Mancos Valley community is voluntarily committed to assisting the Colorado Department of Public Health and Environment in making future refinements to their source water assessment and to revise the Source Water Protection Plan accordingly based on any major refinements.

Table 13. Source Water Protection Priorities and Best Management Practices

Priority Issue	Management Approach	Implementer
Septic Systems		
Public Education	<ol style="list-style-type: none"> <li>1. Develop a public education program for property owners within the SWPA to provide basic information on the Source Water Protection Plan. Public education will include: the proper use and maintenance of their septic systems and how the source of their drinking water can be affected by an inadequately functioning septic system. An educational flier like the one published by the National Small Flows Clearinghouse (NSFC) entitled <i>Groundwater Protection and Your Septic System</i> can be sent to homeowners.</li> <li>2. Develop a mailing list of residents within the SWPA who have septic systems and send them educational materials.</li> </ol>	<p>Montezuma County Health Department Steering Committee</p> <p>Steering Committee</p>
Septic System Inspection Program	<ol style="list-style-type: none"> <li>1. The County Health Department will continue to implement their optional Septic System Inspection Program upon request of the property owner. The Health Department will use this opportunity to educate the property owner on the link between good septic practices and protecting source water.</li> </ol>	Montezuma County Health Department
Coordinating New Construction and Permits	<ol style="list-style-type: none"> <li>1. The County Health Department will work be encouraged to work closely with the land use department on subdivision review for septic system uses and with the building department to ensure that whenever a building permit is applied for, the Health Department makes sure that adequate wastewater treatment is planned for.</li> <li>2. The County Health Department will be encouraged to use this opportunity to educate the property owner on the link between good septic practices and protecting source water.</li> <li>3. The County Health Department will be encouraged to provide information to the Town of Mancos or the Steering Committee upon request of any new septic permits issued in the SWPA.</li> </ol>	<p>Montezuma County Health Department</p> <p>Montezuma County Health Department</p> <p>Montezuma County Health Department</p>

Table 13. Source Water Protection Priorities and Best Management Practices

Priority Issue	Management Approach	Implementer
Roads: Spills & Sediment		
Road Maintenance	<p>1. Keep informed on the road maintenance practices and schedules within the Source Water Protection Area (SWPA) including: grading, de-icing, dust abatement and Best Management Practices used.</p> <p>2. Provide a copy of the Source Water Protection Plan and map of the protection area to the Montezuma County Road Department. Encourage them to use road Best Management Practices to prevent road materials from entering the source waters.</p>	<p>Steering Committee</p> <p>Steering Committee Montezuma County Road Department</p>
Vehicular spills	<p>1. Meet with the local fire departments to discuss their emergency response plans for responding to hazardous and non-hazardous vehicular spills within the SWPA. Include this information in the emergency plans for each water system.</p> <p>2. Provide information to the local fire departments:</p> <ul style="list-style-type: none"> <li>• Importance of the Source Water Protection Plan</li> <li>• Location of the intakes and Source Water Protection Area</li> <li>• Overview of the Emergency Contingency Plan</li> <li>• Personnel to be notified in the event of an emergency</li> </ul>	<p>Steering Committee</p> <p>Water Utility</p> <p>Steering Committee</p>
Public Education	<p>1. Cooperate with public agencies to educate the public on how to call "911" to report any spills within the SWPA.</p> <p>2. Educate the public about reporting spills on local roads through the use of area newspapers.</p>	<p>Steering Committee Montezuma County Office of Emergency Management</p> <p>Town of Mancos</p>



Table 13. Source Water Protection Best Management Practices

Priority Issue	Management Approach	Implementer
Land Use		
Land Use Planning and Controls	<p>1. County land use planners will be encouraged to overlay the Mancos Valley community’s SWPA on their land use map and to refer to it during decisions on land use in the area.</p> <p>2. County Commissioners will be encouraged to consider source water protection of the Upper West and Middle Mancos Rivers when making land use decisions or zoning laws. Land use controls may include: subdivision growth controls, zoning, and land use restrictions.</p> <p>3. The Mancos Valley drinking water providers will request to be notified by Montezuma County Planning and Zoning Department officials of land use hearings or meetings regarding land within the SWPA and will have the opportunity to participate in the process.</p> <p>4. Steering Committee will provide the Montezuma County Planning &amp; Zoning Department a copy of the Source Water Protection Plan and mapping GIS data of the protection area.</p>	<p>Montezuma County Planning &amp; Zoning Department</p> <p>Montezuma County Commissioners</p> <p>Town of Mancos Mancos Rural Water Co. Mesa Verde National Park Montezuma County Planning &amp; Zoning Department</p> <p>Steering Committee</p>
Land Acquisitions	<p>1. Steering Committee will keep informed of land acquisitions within the SWPA and provide information to new residents on the source water protection area.</p>	Steering Committee
Land Conservation	<p>1. Provide information to landowners within the SWPA to educate them on the opportunities of placing a conservation easement on their land.</p>	Steering Committee
Watershed Protection District	<p>1. Provide information to the Town of Mancos on the opportunity of protecting the drinking water source for the Town through the use of an ordinance that develops a watershed district.</p>	Colorado Rural Water Association

Table 13. Source Water Protection Best Management Practices

Priority Issue	Management Approach	Implementer
Agricultural Uses		
Public Outreach and Communication	<ol style="list-style-type: none"> <li>1. Create a mailing list of private agricultural land owners within Zone 1 of the SWPA.</li> <li>2. Maintain an open dialog with the agricultural users in order to encourage stewardship of their lands to protect the quality of the surface and ground water.</li> <li>3. Provide land owners with information on agricultural Best Management Practices for grazing management, handling manure, chemical application, and chemical use and storage.</li> <li>4. Provide land owners with information on the water quality impacts of grazing within the creeks and on stream banks. Educational material will encourage the use of BMPs on: alternative stock watering, livestock exclusion fencing, creating a buffer zone between the cattle and the creek, and bioengineering stream bank stabilization practices.</li> <li>5. Education techniques may include: workshops, mailings and community meetings/workshops, and demonstration projects.</li> <li>6. The local NRCS Field Office and the local Conservation District will be encouraged to provide site visits (upon request) to residents within the SWPA to evaluate their agricultural practices and provide educational outreach.</li> </ol>	<p>Steering Committee</p> <p>Steering Committee</p> <p>Steering Committee NRCS and Farm Organizations</p> <p>NRCS as consultants</p> <p>Steering Committee</p> <p>NRCS</p>
Funding Opportunities	<ol style="list-style-type: none"> <li>1. Explore funding opportunities and provide residents within the SWPA with information on funding opportunities for cost sharing to implement the agricultural BMPs on their land (i.e. EQIP).</li> <li>2. Provide information to agricultural users on the opportunity of conserving their lands under the Conservation Reserve Program.</li> </ol>	<p>Steering Committee NRCS Conservation Districts</p> <p>Steering Committee NRCS</p>

Table 13. Source Water Protection Best Management Practices

Priority Issue	Management Approach	Implementer
<b>Oil and Gas Development</b>		
Information Sharing and Public Outreach	<ol style="list-style-type: none"> <li>1. Stay informed of any potential oil and gas developments on public lands within the protection area and become involved in the public process to encourage BMPs to protect water quality. The Steering Committee will request that the BLM and USFS notify the community of any future applications on public lands within the protection area.</li> <li>2. Stay informed of any potential oil and gas developments on private lands within the protection area through the use of COGCC’s website mapping, by contacting the regional COGCC representative, and requesting that Montezuma County Land Use Department notify the community of upcoming permits within the protection area.</li> <li>3. Send a request to the CDPHE’s SWAP program manager to provide the newly delineated boundary of the protection area to COGCC to ensure that the new protection zones for drinking water sources are available to both public and industry.</li> <li>4. Encourage the local community to become actively involved in participating in local and regional oil and gas forums.</li> <li>5. Stay informed of future pipeline construction activity, provide the pipeline company with a copy of the protection plan, and request a copy of their spill notification protocol. Request that the pipeline company notify the local drinking water providers when spills occur.</li> </ol>	<p>Steering Committee BLM U.S. Forest Service</p> <p>Steering Committee COGCC Montezuma County Land Use</p> <p>Colorado Rural Water Association CDPHE</p> <p>Steering Committee</p> <p>Steering Committee</p>
<b>Mining</b>		
Assessment and Water Quality Monitoring	<ol style="list-style-type: none"> <li>1. Field check mine sites to determine their potential for contaminating downstream water supplies.</li> <li>2. Conduct water quality monitoring downstream from the mine sites.</li> </ol>	<p>Steering Committee</p> <p>Steering Committee</p>

Table 13. Source Water Protection Best Management Practices

Priority Issue	Management Approach	Implementer
Residential Practices		
Public Education and Outreach	<p>1. Conduct public education and outreach programs for SWPA residents to encourage practices that will protect their drinking water source. Topics may include: source water protection, household hazardous waste storage and disposal, fertilizer usage, pet waste cleanup, water conservation, car washing, and secondary containment for above ground fuel storage tanks.</p> <p>2. Opportunities for public education include: newspaper articles, poster displays at local utility offices and public buildings, water bill inserts, flyers, creek festivals, public forums, workshops and community events.</p> <p>3. Participate in local conservation workshops and provide materials about the Source Water Protection Plan and BMPs to prevent contamination of the local aquifer (i.e. NRCS Roundtable).</p>	<p>Steering Committee Water Utility Local Government</p> <p>Steering Committee</p>
Regional Air Quality		
Information and Participation	<p>1. Stay informed of air quality issues, meetings, remediation actions, studies, and reports on the Four Corners Region of Colorado.</p> <p>2. Participate in the Four Corners Air Quality Group meetings to receive updates on the progress of the air quality remediation efforts and to provide additional input. Contact Mark Jones of the New Mexico Environment Department at (505) 327-6854 for information on the dates of future meetings. Another contact is Christopher Dann of the Colorado Department of Public Health and Environment at (303) 692-3281.</p>	<p>Steering Committee</p> <p>Steering Committee</p>

Table 13. Source Water Protection Best Management Practices

Priority Issue	Management Approach	Implementer
Water Utility		
Water Supply Intakes	<ol style="list-style-type: none"> <li>1. Perform regular inspection of the surface water intakes.</li> <li>2. Protect areas around intakes with fencing and signage.</li> </ol>	<p>System Operators</p> <p>System Managers</p>
Water Operations	<ol style="list-style-type: none"> <li>1. Ensure that the water treatment plant is properly managed, operated and maintained to prevent contamination of the drinking water.</li> <li>2. Store chemicals properly at the treatment plant.</li> <li>3. Ensure that all employees are familiar with the Source Water Protection Plan, emergency and contingency plan, and hazardous spill response.</li> </ol>	<p>System Managers</p> <p>System Managers</p> <p>System Managers</p>
Public Education	<ol style="list-style-type: none"> <li>1. Develop a mailing list of land owners and residents within the protection area.</li> <li>2. Provide Information concerning the SWPP in the annual Consumer Confidence Report (CCR). Insert an additional letter or paragraph in the CCR of their presence within the protection area and information on how they can help prevent pollutants from entering the source waters.</li> </ol>	<p>Steering Committee</p> <p>Town of Mancos Mancos Rural Water Co. Mesa Verde National Park</p>
Water Quality Monitoring	<ol style="list-style-type: none"> <li>1. Conduct water quality monitoring of surface water upstream of the intakes as required by CDPHE for E. coli during 2009.</li> <li>2. Work together with the Mancos Valley Watershed Project on developing a water quality monitoring plan upstream of the intakes.</li> </ol>	<p>System Managers</p> <p>Steering Committee Mancos Valley Watershed Project</p>

Table 13. Source Water Protection Best Management Practices

Priority Issue	Management Approach	Implementer
Public Lands		
Forest Fires	<p>1. Fuels Reduction – The District Ranger will continue to implement the National Fire Plan to reduce fuels within the National Forest lands within the watershed.</p> <p>2. Fire Prevention – The District Ranger will continue to implement their fire prevention plan which includes public education programs: Fire Wise program and Project Learning Tree.</p>	<p>Dolores Ranger District Public Lands Office</p> <p>Dolores Ranger District Public Lands Office</p>
Livestock Grazing	<p>1. Obtain a map of the livestock grazing allotments in the watershed and environmental assessment reports that pertain to livestock grazing.</p> <p>2. Conduct intensive analysis of the allotments within the planning area.</p> <p>3. Identify monitoring that evaluates livestock impacts on riparian areas and water quality. Encourage the use of BMPs to minimize source water impacts.</p>	<p>Steering Committee Dolores Ranger District Public Lands Office</p> <p>Dolores Ranger District Public Lands Office</p> <p>Dolores Ranger District Public Lands Office</p>
Roads and Sediment	<p>1. The USFS will continue to use road maintenance BMPs and management decisions to prevent sediment delivery to streams. These may include grading, culverts, sediment basins, water bars, stream bank revegetation, as well as seasonal and permanent road closures.</p>	<p>Dolores Ranger District Public Lands Office</p>
Timber Harvesting	<p>1. Implement Water Conservation Practices, BMPs, guidelines, and proper design criteria to prevent or reduce sediment delivery to water bodies within the watershed.</p>	<p>Dolores Ranger District Public Lands Office</p>

Table 13. Source Water Protection Best Management Practices

Priority Issue	Management Approach	Implementer
<b>Public Lands (continued)</b>		
Recreational Activities	1. Minimize the effects of recreational activities within the watershed from both motorized and non-motorized activities. Continue to provide multiple uses while restricting motorized vehicles to system authorized roads that are signed. Prevent OHV damage to stream banks and upland areas surrounding the Upper West and Middle Mancos Rivers and its tributaries. Restore or close areas degraded by OHV usage.	Dolores Ranger District Public Lands Office
Oil/Gas Development	1. The Steering Committee will request that the BLM and USFS notify the community of any future applications on public lands within the protection area.	Steering Committee Dolores Ranger District Public Lands Office BLM
Public Outreach and Participation	1. Keep informed of forest management issues in the watershed, participate in forest planning activities, and work as partners with forest land managers.	Steering Committee Town of Mancos Mancos Rural Water Co. Mesa Verde National Park
<b>Zebra &amp; Quagga Mussels</b>		
Public Education and Outreach	<p>1. Develop a public education campaign that provides information to reservoir users about the zebra and quagga mussels and how to prevent transmission of them into Jackson Gulch Reservoir. Information may include:</p> <ul style="list-style-type: none"> <li>• Good boat hygiene (Decontamination Protocol included in the Appendices of this report)</li> <li>• Disposal of live bait in the trash</li> </ul> <p>2. Opportunities for public education include: newspaper articles, signage at the reservoir, brochures, and stations at the reservoir.</p> <p>3. Work together with agencies (i.e. U.S. Fish and Wildlife, Colorado State Parks, Colorado Division of Wildlife) to explore opportunities for a boat washing station at the reservoir.</p>	<p>Steering Committee Town of Mancos Mancos Rural Water Co. Mesa Verde National Park</p> <p>Steering Committee</p> <p>Steering Committee</p>

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## **APPENDICES**

Contingency Plan \*

Source Water Assessment Report and Appendices (On CD)

Meetings: Contact List, Attendance Roster, and Minutes

Mancos Valley Salinity Hydrology Report (On CD)

San Juan Forest Draft Management Plan (On CD)

Functional Assessment of the Mancos River Watershed (On CD)

Box Canyon TMDL Final Evaluation (On CD)

Four Corners Air Quality Task Force Report (On CD)

Funding Sources for Source Water Protection

Citizen's Guides, Handbooks, Maps, and Miscellaneous Reports (On CD)

Glossary (On CD)

*Notice: This public document will only include information that is not deemed sensitive to the safety and operation of the individual community's water plan operation. Appendices marked with a \* are only included in the Public Utility's report or kept on file at their office. A CD is included in the back pocket of this report and includes documents that can be reprinted.*